ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2016 ISSUE NO. 1 PAGES 4217 - 4244

Cover Picture

The analytical balance on our cover was made by Josef Nemetz. His balances are mechanical marvels manufactured between 1874 and 1908. To learn more about these extremely intricate mechanisms read the article The Nemetz Balance of the Science Museum of Porto on pages 4219 to 4225 of this issue of EQM.

Contents

The Nemetz Balance of the Science Museum of Porto
Thomas Allgeier 4219-4225
A Pre-Metric Spanish Steelyard
Lionel Holland 4226-4228
Almost Instant Gratification
Jan Berning 4229-4231
Weighing Snow
Bill Berning 4232-4235
My Unusual *Abacus Scale;* N & Q 162
Vernon Denford 4236-4238
N & Q 163 4238
Miniature Portable "Brass Box" Sovereign Balance Makers
Michael Foster 4239-4243
Showcase 4243-4244

ISASC
INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

EQUILIBRIUM is published quarterly in February, May, August and November.

© 2016 International Society of Antique Scale Collectors ISSN: 0893-2883

International Society of Antique Scale Collectors
Founded September 1976
Internal Revenue Service 501 (c) (3) EIN 36-2976411
Tel 612.925.1386
www.isasc.org

Officers 2016

President . . . . Bob Hayden
Vice Presidents . . . . Greg Hill
. . . . Jerome Katz
. . . . Greg Moss
. . . . .Mary Anne Murphy
. . . . .Shirley Schmidt
Secretary . . . . Carol Hayden
Treasurer . . . . Kurt Beyreis

For membership information contact
Shirley Schmidt sschmidt@avci.net
5790 N. Lakeshore Rd. Palms, MI 48465

Published with the co-operation and support of
ISASC Europe
Founded October 1993

CHARITY COMMISSIONERS FOR ENGLAND & WALES NO 1037558
www.isasce.com

Trustees and Officers 2014-2016*

Chairman . . . . John Knights*
Secretary . . . . Thomas Allgeier*
Treasurer . . . . .Mike Sharpe*
Meeting Secretary . . . . Peter Elliott
European Representative . . . . .Jaap Visser
Publications Officer. . . . . David Apps
Information Officer . . . . . . D Crawforth-Hitchins
Trustee . . . . Ken Govier*

For membership information contact
John Knights, johnsknights@btinternet.com

Editor: Jan H. Berning, **Tel** 815.895.6328 **Fax** 815.895.6328 JHBerning@comcast.net
Associate Editor: Charley Amsbaugh **Tel** 443.952.7681 research.eggscales@comcast.net
Associate Editor: Diana Crawforth-Hitchins **Tel** 01865.763096 lehitchins@aol.com

Article submissions are preferred in MS Word with Times New Roman Font size 12.
Photos are best in 300 DPI Jpegs in a separate file with a maximum of 3 photos per Email.

The Nemetz Balance of the Science Museum of Porto

BY THOMAS ALLGEIER

Or: Options lists are not an invention of 20th century car makers.

Some readers may remember my article about digitising the Jenemann archive from a previous edition of EQM. This project is still ongoing, but as you would imagine there are occasional interruptions when Ritzo Holtman and I get side-tracked. While we strive to make progress with the thousands of pictures as fast as we can, it still seems worthwhile to spend time on interludes such as this one, in particular when the subject is not entirely disconnected from the main task.

Ritzo was contacted by Marisa Monteiro, curator of the Museu de Ciência, Universidade do Porto. That museum has in their possession the fabulous Josef Nemetz balance pictured on the cover page of this edition. She wanted to find out a bit more about it and at the same time thought it would be a good subject to raise the profile of her institution within the world of historic instruments.

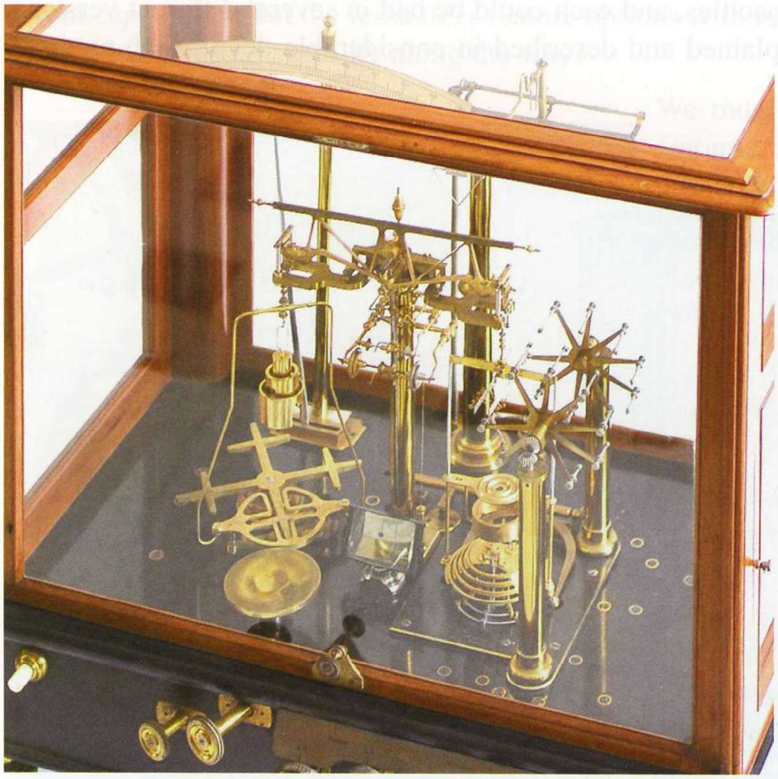


Figure 1. ▲▲ A close-up view of the Nemetz balance of the Museu de Ciência, Universidade do Porto. Note: Three of the 50 g weights were mistakenly placed on the left suspension, see Fig. 5 for correct assembly.

Nemetz, of course, was a maker whom Hans Jenemann[1] had written about, and whose balances he has photographed in the process of his researches. So, while our archive is not quite finished, we still thought we could put what we have to good use, and tell you a little more about these mechanical marvels all at the same time.

While Nemetz was a very prominent maker over a significant period of time, and while his balances were once world-famous due to their prominence in the highest realms of mass metrology, there seems to be very little tangible information available nowadays, apart from Jenemann's publication and a small number of catalogues[2,3,4,5,6] and price lists.

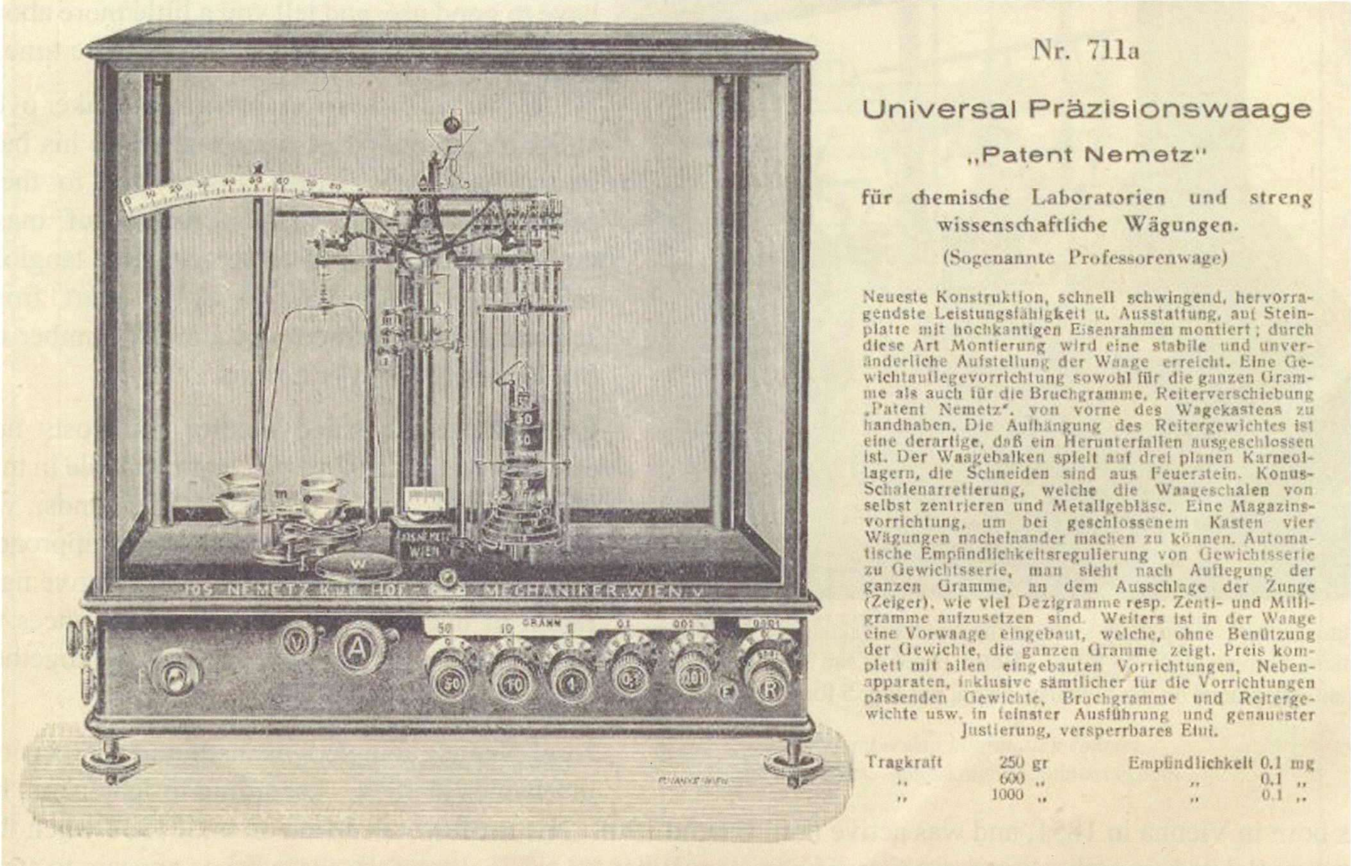
Ritzo, as usual, shied neither fromcosts nor efforts to get hold of all that was available in this respect, and, while discussing his finds, we decided that I should focus on Nemetz' approach to selling balances, coupled to a descriptive narration of his many inventions and advances to balance design. The two subjects go together better than you might think.

Josef Nemetz founded his institute for precision mechanics in 1874. According to Jenemann, he was born in Vienna in 1851, and was active until around 1908. His successors carried on until 1938 when the firm was deleted from the Austrian company register. What we are looking at in these pages appears to stem from the "peak period" of this particular maker, and perhaps also of Vienna as a centre of excellence in balance making.

The eye-opener for me was his catalogue of 1891. Show me another example of a balance maker's advertising of that period which comprises of 182 pages, only dealing with what we would now term precision / scientific balances and weights. There are no trade scales etc. in this catalogue, but otherwise it probably contains at least one example of each and every balance that could be used for scientific purposes known to man. Excerpts were re-published in 1893 as “Spezial-Kataloge” in separate sections, not all of which have been found yet. Several other editions (1884, 1885 and 1897) are known to exist, but have also not yet found their way into Ritzo’s archive. By comparison, Albert Rueprecht's equivalent of 1911 runs to 76 pages, earlier editions were shorter.

Nemetz' pamphlets are richly illustrated, with very detailed descriptions of his inventions, of principles used in his instruments, and of the specific balances themselves. No expense was spared in their production, mirroring no doubt the approach taken for the manufacture of the products shown therein. One assumes there was method behind the madness: You would probably not want to portray the crème de la crème of scientific instruments, the more elaborate ones of which costing small fortunes, in a cheap and cheerful rag that leaves many questions a potential buyer might have unanswered.

So, there are dozens of individual models and capacities, and each could be had in several different versions and with several add-on features. All this is explained and described in considerable detail, with a corresponding price entry.


JOS. NEMETZ K.u.K. HOF
MECHANIKER. WIEN. V
GRAMM

Nr. 711a

Universal Präzisionswaage

„Patent Nemetz“

für chemische Laboratorien und streng wissenschaftliche Wägungen.

(Sogenannte Professorenwage)

Neueste Konstruktion, schnell schwingend, hervorragendste Leistungsfähigkeit u. Ausstattung, auf Steinplatte mit hochkantigen Eisenrahmen montiert; durch diese Art Montierung wird eine stabile und unveränderliche Aufstellung der Waage erreicht. Eine Gewichtauflegevorrichtung sowohl für die ganzen Gramme als auch für die Bruchgramme, Reiterverschiebung „Patent Nemetz“, von vorne des Wagekastens zu handhaben. Die Aufhängung des Reitergewichtes ist eine derartige, daß ein Herunterfallen ausgeschlossen ist. Der Waagebalken spielt auf drei planen Karneollagern, die Schneiden sind aus Feuerstein. Konus-Schalenarretierung, welche die Waageschalen von selbst zentrieren und Metallgebläse. Eine Magazinsvorrichtung, um bei geschlossenem Kasten vier Wägungen nacheinander machen zu können. Automatische Empfindlichkeitsregulierung von Gewichtsserie zu Gewichtsserie, man sieht nach Auflegung der ganzen Gramme, an dem Ausschlage der Zunge (Zeiger), wie viel Dezigramme resp. Zenti- und Milligramme aufzusetzen sind. Weiters ist in der Waage eine Vorwaage eingebaut, welche, ohne Benützung der Gewichte, die ganzen Gramme zeigt. Preis komplett mit allen eingebauten Vorrichtungen, Nebenapparaten, inklusive sämtlicher für die Vorrichtungen passenden Gewichte, Bruchgramme und Reitergewichte usw. in feinster Ausführung und genauester Justierung, versperrbares Etui.

Tragkraft	250 gr	Empfindlichkeit	0.1 mg
„	600 „	„	0.1 „
„	1000 „	„	0.1 „

Figure 2. ⋀⋀ “Professorenwaage” from Nemetz 1906 catalogue.

The esteemed customer desires his chosen model with patented rider movement, fractional weight loading and selectable sensitivity - no problem at all! A vacuum balance perhaps, with remote operation from 3 metres away and mirror readout through a telescope? Again, we can deliver that. Or would you even want a balance constructed entirely to your own design and requirements? Just let us know exactly what you want, and we will build it for you.

In modern terms, think of the glossy brochures of a Japanese car maker with his many models, and even more optional extras, at the same time combined with the customer-focussed approach of Rolls-Royce who will incorporate into their cars any such feature as a paying customer could want to desire, as long as it is legal. However, it must have dawned on Josef Nemetz that the broad approach to what is essentially a narrow range of products could not have been all that economical. So he actually states in one section that although there are numerous combinations possible, in his experience most customers order pretty much the same balance. This led him to design and market his "Universal-Präzisionswaage System Nemetz" to which he dedicates 3 pages. We can probably deduce something about the man from the fact that he then goes and spoils it all by offering this item in no less than 8 different versions! We could perhaps forgive 2 of them as they are of different capacities. But the remainder feature options with respect to their weight-loading mechanism - where did we loose the universality along the way?

We must now return to Marisa's wonderful machine, its features, and corresponding extracts from Jenemann's picture archive.

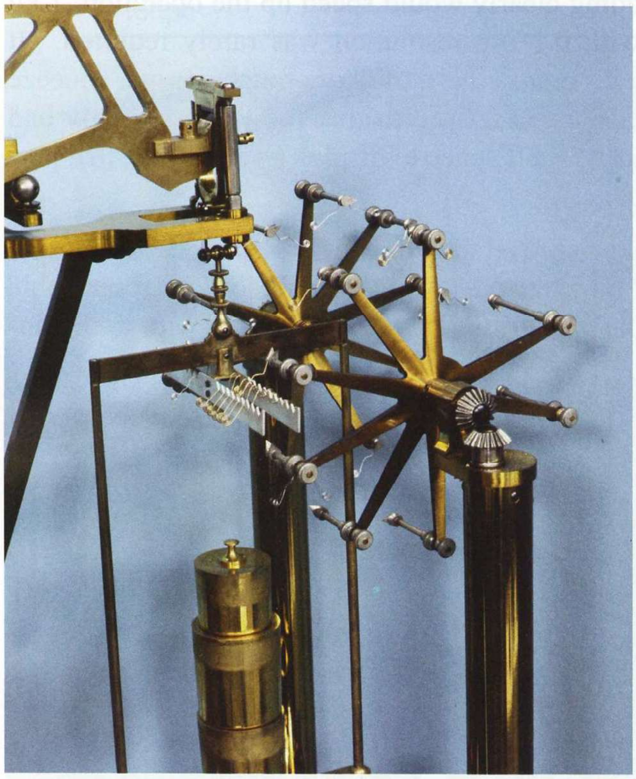


Figure 3. ⮝⮝ Probably the most famous of Nemetz' original designs: The double carousel fractional weight loader.

In the Nemetz 1906 catalogue, the balance from the Porto museum is referred to as "Professorenwaage", the Professor's model of balances.

It came in 3 capacities, 250 g, 600 g or 1000 g, all with a sensitivity of 0.1 mg. Marisa's is the 250 g, it was made in 1906.

The following features are listed in the description and can be identified from the photos:

- Full weight loading, both of the large weights and the fractionals, the latter using the well-known double carousel of Nemetz' own invention.
- Nemetz' patented rider movement with the vertical column behind the beam.
- Selectable sensitivity (4 ranges) by placing 3 weights on the pointer to lower the centre of gravity as required.
- A weight exchanger on the left hand pan, with 4 positions. This is to carry out intercomparisons by substitution weighing without opening the case.
- A pre-scale (the graduated arc over the left hand pan) showing to the nearest gram or 10 grams which weight needs to be selected on the right hand side.
- Cone-type pan arrestment, another unique Nemetz feature.
- A "blower" which utilised a metal bellows, operated by the button on the left side, used to control the oscillations of the beam by directing a faint blast of air to the underside of one pan.

It is my strong belief that Nemetz sold these kinds of assemblies to the Professors not only for actual use, but also to advertise the various mechanisms to students (as future potential customers):
The 4-position weight exchanger is used to determine the differences between 4 nominally equal weight pieces in comparison weighing, or perhaps samples in series of analytical tests. For day-to-day use this is not a must-have item, but more a case of: Look here what we can do!
The pre-weighing scale is of course very useful if a completely unknown weight has to be determined, and the same applies for the sensitivity-switching attachment. This may not be the kind of work you would routinely do with such a superb instrument, but it does show off the ingenious designs of Mr Nemetz very effectively. Of course the fact that Mr. Rueprecht also offered many of these optional features may have had something to do with it.

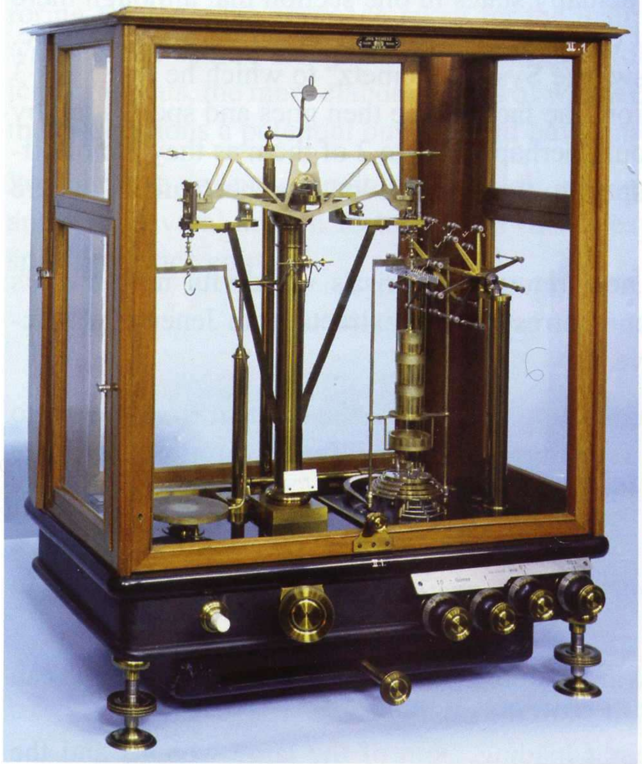


Figure 4. ⮝⮝ Nemetz balance N1, Mettler museum, Greifensee.

In 1900 - and even today - one would have had 2 different instruments if the same laboratory was even expected to carry out so widely different tasks as weight intercomparisons and analytical weighings. On the former, you would want as few mechanical distractions as possible, not cluttering up the balance case, keeping everything simple and symmetric. On the latter, while the pre-weighing and weight loading clearly would speed up the operation, 1 kg capacity with 0.1 mg resolution was rarely required. It seemed to be more a case of "how much can we squeeze into this balance case", given that the Professor only had about 3 feet of shelf space to display (= advertise) that particular product.

Ritzo thinks the reverse argument is also a possibility, and I agree: "Look here what a great Professor I am, being able to afford the top-of-the-range balance fitted with every single feature that is possible to obtain." Calling it the "Professorenwaage" was certainly a brilliant bit of marketing.

Hans Jenemann took detailed, high quality pictures on medium format film of 3 of these magnificent balances: 2 were located at the Mettler museum at Greifensee (identified as N1 and N3 in the following) and one at the Technical Museum at Vienna (N2). Of a fourth balance also located at the Vienna museum we found no images - somewhat strange considering the many thousand pictures he took, and the many dozens taken of the other 3 Nemetz balances.

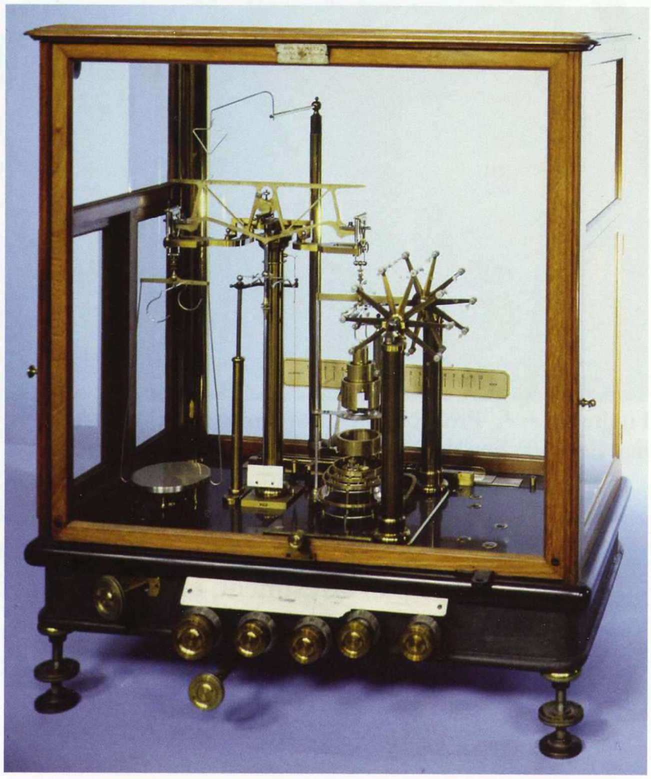


Figure 5. ➢➢ Nemetz balance N2, Technisches Museum Vienna.

They all carry a varying amount of accessories and options, with N3 being the most "loaded" example. N3 is also the youngest, since it has the later version of mg weight loading which has done away with the carousel feature and uses push-rods instead.

We probably need the following table to keep track of what was fitted to which of the 4 balances:

FEATURE	N1	N2	N3	PORTO
mg weight loading with carousel	√	√	-	√
later style of mg weight loading	-	-	√	-
weight loading to 100 g in total	√	√	√	√
weight loading to 250 g in total	-	√	√	√
Nemetz rider mechanism	√	√	√	√
selectable sensitivity (2 ranges)	√	√	-	-
selectable sensitivity (4 ranges)	-	-	√	√
blower to control swing	√	-	√	√
pre-weighing mechanism	-	-	√	√
weight exchanger	-	-	√	√
loupe	-	-	-	√

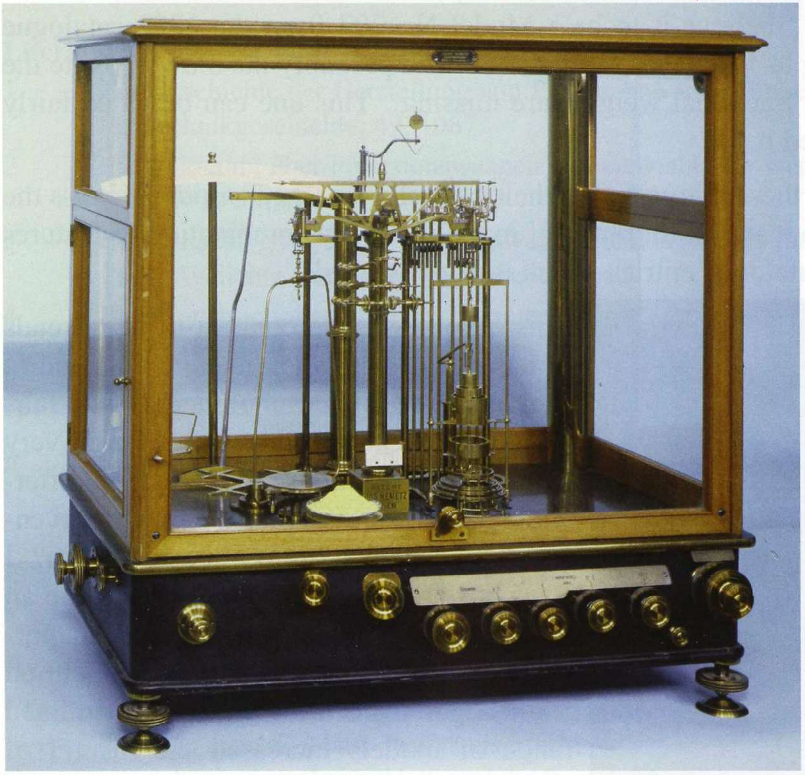


Figure 6. ⩓⩓ Nemetz balance N3, Mettler museum, Greifensee.

From this table we can take that Marisa's Porto balance is closely related to N3 at Metter/Greifensee, but clearly pre-dates it on account of the earlier carousel weight loader. N1 is the simplest model of the 4, N2 is fairly similar but has a larger weight-loading range.

Hans tried out the pre-weighing attachment when he took the pictures, which gives us a unique glimpse of how it worked: It is an entirely independent scale, either with pendulum or spring resistant, using a separate pan and a large fan-style chart with very long pointer. A sample of powder has been placed on the separate pan, the weight of which can be seen indicated. His collection of images also contains various close-ups of other parts of the mechanism. Space does not permit us to show them all, you will have to wait until our archive of his material has gone on-line.

In the meantime there are three more Nemetz balances we can show here: The first was the subject of an article in “Meten & Wegen”, the Dutch collector society’s journal in 2009[7]. It is an analytical balance with some, but not all of the available features:

The earlier carousel-style weight loading to 1 g, the “blower” to control the swing, the Nemetz rider mechanism, the cone pan arrestment and, as far as we can make out, dual-range sensitivity. The balance is significant in that it can be precisely dated to 1901, this year being stamped into the wood just above the maker’s name plate.

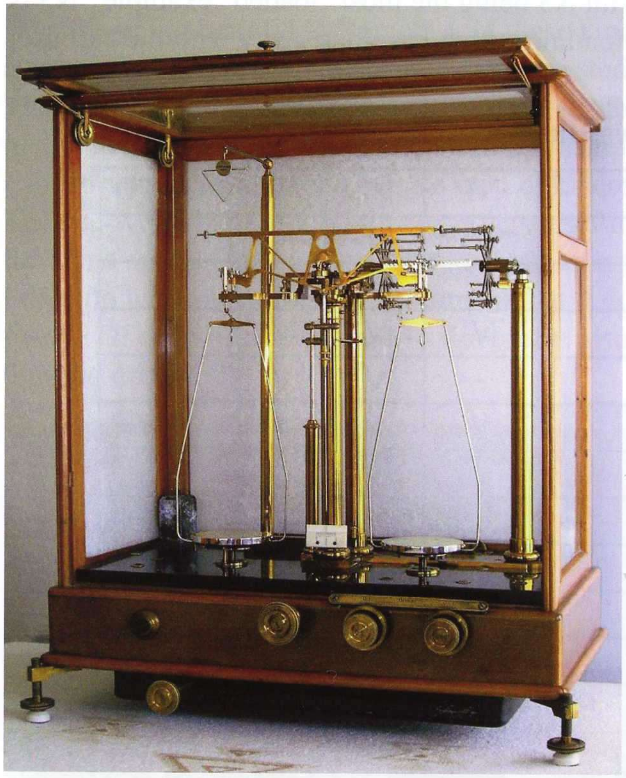


Figure 7. ≺≺ Nemetz balance of 1901 (Meten&Wegen, June 2009).

The second is located in the Hungarian Museum for Science, Technology and Transport in Budapest. It was brought to our attention by Dr Alison Morrison-Low, curator of the National Museum of Scotland, who photographed it there in 2010.

It appears to be of higher capacity than the one previously described, and it has a slightly different selection of options fitted: Weight loading to what looks like 100 g, with old-style carousel fractionals, blower, rider, but only single-range sensitivity.

The latest addition to the known Nemetz balances is located at the Historic Collection of the University Vienna, Faculty of Physics. It was brought to our attention by Jean-Francois Loude, who also discovered the "Professorenwaage" at Porto and brought us in touch with Marisa. This balance is again a somewhat "simpler" combination of features. We believe it to be a Model Nr. 707 from the 1893 catalogue with a capacity of 250 g. It has weight loading to 100 g, the Nemetz rider and probably the blower. Note the right hand suspension is off the beam and the fractional weights are missing. This one can be dated fairly accurately to 1894, when the institute purchased it.

While there is never an excuse needed to show these marvels with their beautiful polished wood and brass the last three pictures are included to clearly prove that the full range of models and any combination of features actually found their buyers; they are not just catalogue entries which nobody wanted.

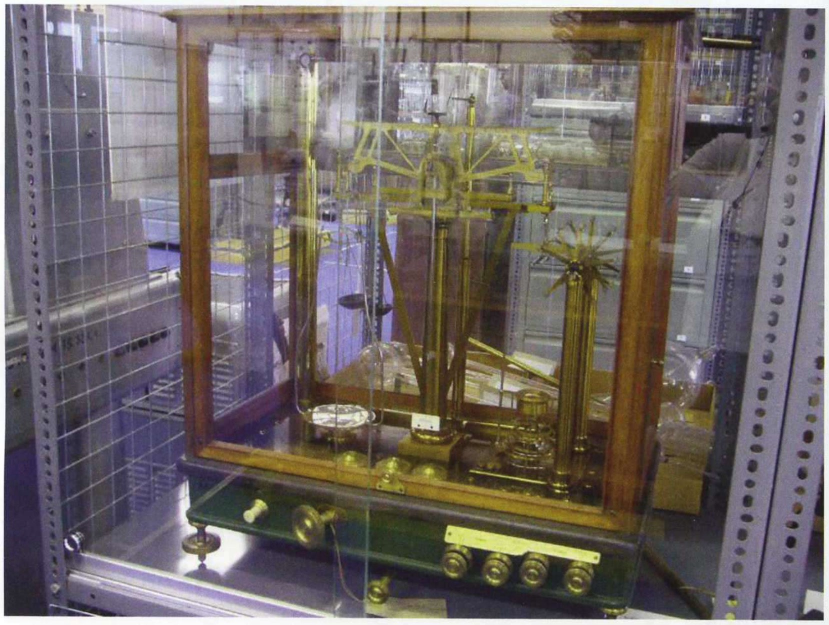
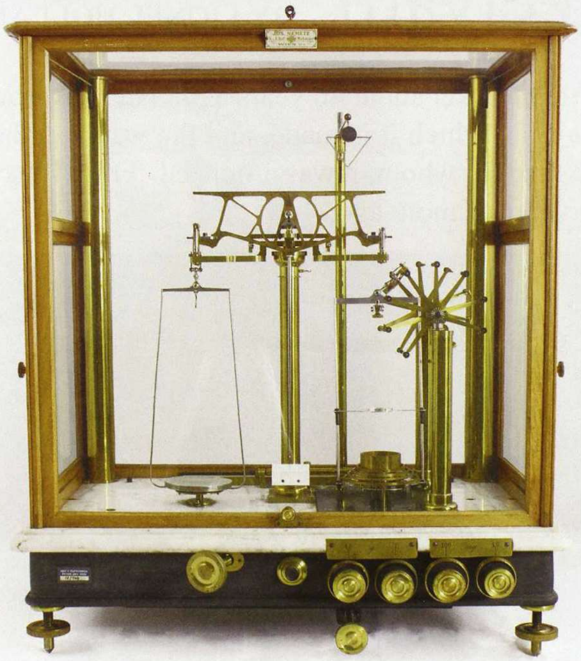


Figure 8. ⋏⋏ The Nemetz balance of the Hungarian Museum for Science, Technology and Transport.

This is somewhat in contrast to later trends in balance design when makers focussed to standardise on a handful of models with fairly common features, there often being very few selectable options. Did Nemetz' different approach perhaps play a part in the eventual disappearance of his once-great firm? I suspect so – as costs must have become an ever more important consideration in purchasing such equipment, and as competition from larger firms with a more streamlined range of models increased the mantra of "You can have any balance with any combination of features – and then some" was probably unsustainable in the long run.

There is another danger to this approach of overloading an otherwise useful balance with too many complicated mechanisms (an illness Ritzo terms "featureitis"). We all



know if we buy the car with all the electric options and gadgets we will have either frequent trips to the repair workshop or else are faced with much frustration when something has gone wrong, and it would appear balance users and makers were faced with much the same situation. Josef Nemetz' main competitor Albert Rueprecht was in receipt of a letter[8] of complaint by none other than Wilhelm Conrad Roentgen (of X-rays fame) in which the latter points out that after several repairs and improvements to his newly-purchased balance he cannot be expected to be exposed to yet another such attempt, and would the former please accept the return of the instrument.

Even the greatest of the great get it wrong occasionally.

Figure 9. ≺≺ The Nemetz Balance at the University of Vienna, Faculty of Physics, image courtesy of Franz Sachslehner

Literature

1 Zur Geschichte der Herstellung von Präzisionswaagen hoher Leistung in Wien, Hans R Jenemann, in: Blätter für Technikgeschichte, 49, 1987.

2 Preis-Courant über Präzisionswaagen und Gewichte für wissenschaftliche Zwecke, Jos. Nemetz, Wien, Nr. 6, 1886. R J Holtman collection.

3 Haupt-Katalog Nr. XII, Präzisionswaagen und Gewichte für wissenschaftliche Zwecke, Jos. Nemetz, Wien, 1891. Available from www.books2ebooks.eu.

4 Neu-Constructionen aus dem Institute für Präzisions-Mechanik von Jos. Nemetz, Nr. XIII, Wien, 1893. Museu de Ciência da Faculdade de Ciências, Universidade do Porto collection.

5 Auszugs-Katalog Nr. XIV, 1893, Abtheilung für Präzisionswaagen und Gewichte für wissenschaftliche Zwecke, Jos. Nemetz, Wien. Museu de Ciência da Faculdade de Ciências, Universidade do Porto collection.

6 Präzisionswaagen und Gewichte für wissenschaftliche Zwecke, Jos. Nemetz, Wien, 1906. Museu de Ciência da Faculdade de Ciências, Universidade do Porto collection.

7 Balans van Nemetz uit 1901 met ruitercarrousel, G. Cuynen, in: Meten & Wegen No. 146, June 2009.

8 Letter of W.C. Roentgen to A. Rueprecht, Feb. 10, 1908, probably Munich, offered for sale by zvab.com in September 2015.

Acknowledgements

I am very grateful to Ritzo Holtman for bringing the Porto balance to my attention and for digging up the entire literature used in this article. Many thanks also to Marisa Monteiro for her all-round support and to Jean-François Loude (http://museephysique.epfl.ch). He found the Porto Nemetz during a visit and brought us in touch with Marisa. He also made us aware of the Nemetz at Vienna. Franz Sachslehner was very helpful in supplying the picture at such short notice.

Finally a big thanks to Barry Oliver for remembering the "Budapest picture" and to Alison Morrison-Low for permission to reproduce it.

If proof should ever be needed, isn't ISASC a wonderful international-interdisciplinary bunch of like-minded people?

A Pre-Metric Spanish Steelyard

BY LIONEL HOLLAND

The steelyard shown in Fig. 1 was purchased in a Barcelona flea-market about 40 years ago. No background information was available from the vendor; but the materials from which it is made, and the way they have been utilized, can tell us something about the people by whom, and for whom, it was produced. From its scale markings (see below) we can tell that it was made some 150 years or more ago.

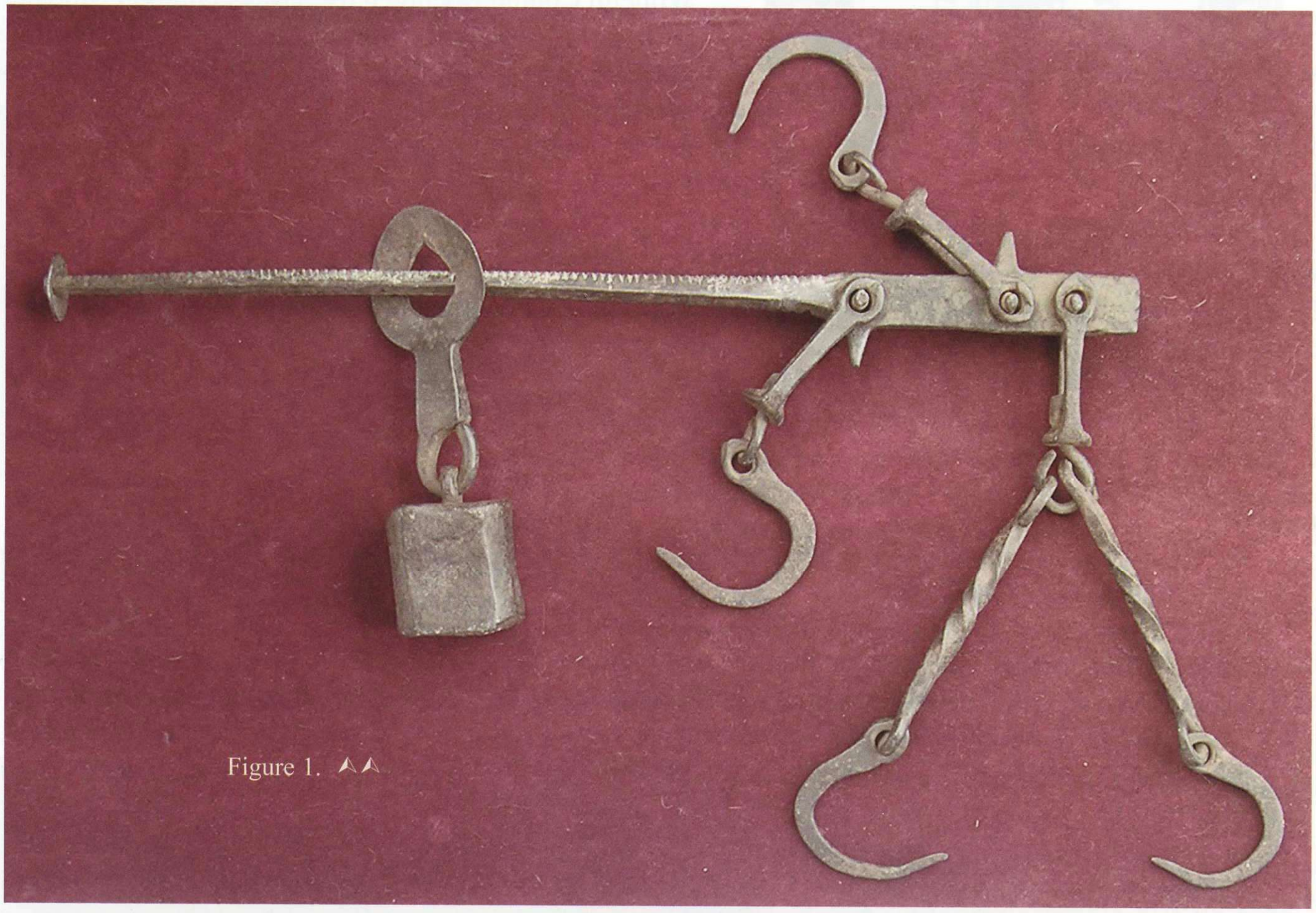


Figure 1.

The instrument is made of wrought iron (except for the beam, which may have been cast). Its dimensions are given in Table 1. It has two hooks, suspended from a single pivot, for the load, and two sets of pivots and bearings with hooks for suspension of the beam, allowing the use of two weighing scales of different ranges. This design is identical in principle, and in many practical details, to that of the copper-alloy steelyards made and used by the Romans many centuries earlier – though all the pivots have (or to be more precise, had) knife-edges, which were unknown in Roman times, and only came into use in Europe around the 16th century. The evident wear on the pivots and bearings of this steelyard (Fig. 2) shows that it has seen a great deal of use.

TABLE 1

DIMENSIONS OF STEELYARD

Entire instrument, including cursor 449 g
cursor 219 g
beam length, butt to tip 280 mm

Light scale :
suspension to pivot 53 mm
pivot to 0 units 12 mm
pivot to 23 units (two dots) 182 mm

Heavy scale:
suspension to pivot 16 mm
pivot to 0 units 9 mm
pivot to 1 unit (four dots) 37 mm
pivot to 7 units 200 mm

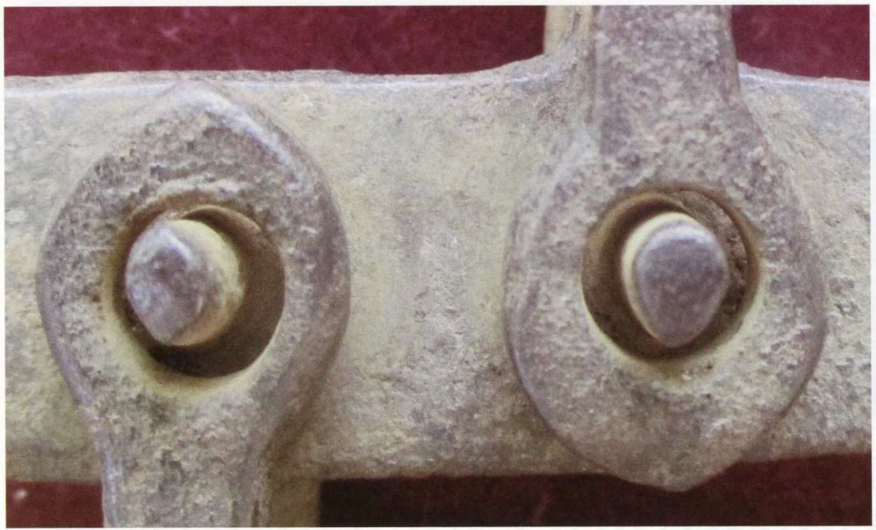
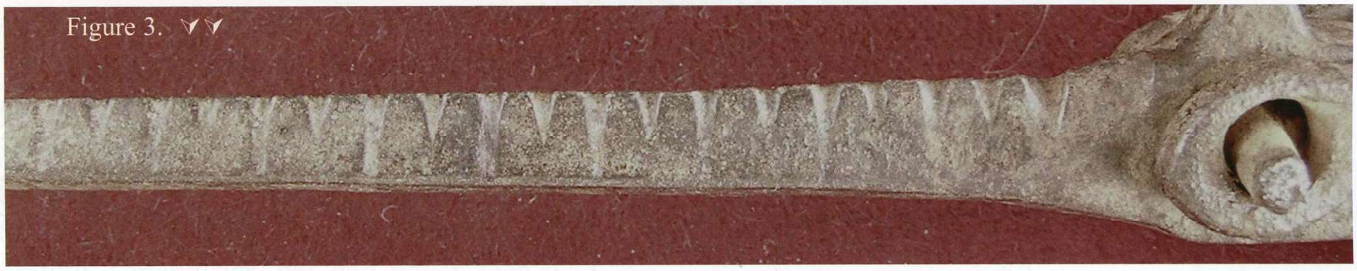


Figure 2. ⮝⮝

The steelyard beam appears to have been cast in a foundry, complete with pointers, and the scale marks added later, during calibration (the stop at the end of the beam is a separate part). It is not possible, without damaging the instrument, to ascertain whether the pivots were also cast as an integral part of the beam, or whether they were inserted and finished later. All the other parts could have been made, and the steelyard assembled, in a well-equipped smithy – one equally capable, no doubt, of producing other useful articles of iron: horseshoes, pokers, tongs, nails, hooks, railings, cartwheel tyres, agricultural and domestic implements, etc. The instrument has been designed with a thoroughly minimalist, utilitarian end in view: almost every single detail of its design is essential to ensure its proper functioning, but nothing more. No effort at all has been expended on embellishment – with one small, but significant, exception (to which I shall allude later). Its designer/manufacturer clearly had two objects in mind: (a) to turn out a sturdy, serviceable implement, which would do its work over a long period of time, while requiring only a minimum of maintenance and repair; and (b) at the same time, to maximize productive output, by designing an article which could be produced with as little work, and in as short a time, as possible. This steelyard has been assembled from only 17 (or possibly, 20, if the pivots were not integral with the beam) separate parts. The chains, which on Roman and Byzantine bronze steelyards, were used for attaching the load hooks, have been replaced here by rigid rods of iron. Had this steelyard been equipped with chains, it would have taken far longer to produce, without gaining any functional advantage. The image conjured up is of an ironworks of considerable ability, serving a clientèle with demanding operating requirements, but with no money at all to waste on fripperies.

Figure 3. ⮟⮟



From the 16th century onwards, for several centuries, much of the wealth of Spain was generated and maintained by the importation of huge quantities of gold and silver from the mines of the Imperio de las Indias. Local industries were not developed in Spain to anything like the same extent as in other European countries. Spanish society was organized in a rigid hierarchy: at the top, a small ruling class, owning most of the land and other sources of wealth; below these, a middle class of businessmen, professionals, clerics, etc.; and at the bottom, a rural population, supporting itself by subsistence farming, mostly on land belonging to others. It is most likely among this last group that this steelyard had its origins.

A look at the scale-marks along the beam helps to date the steelyard. The beam is of rectangular cross-section, with scales marked out along each of two opposite sides. One scale is divided into units (26 in all), each indicated by a notch, and a line graven across the width of the beam; half-units are indicated by a partial line (Fig. 3). The other scale is divided duodecimally. There are seven full units, indicated by punch-marks ; each unit is divided into twelve sub-units (Fig. 4). This division is a sure indicator that the scales were made to a non-metric measure.

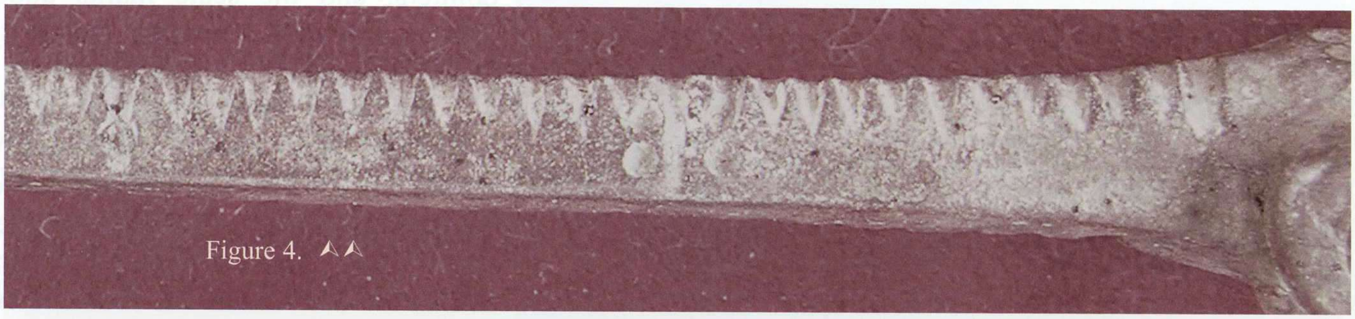
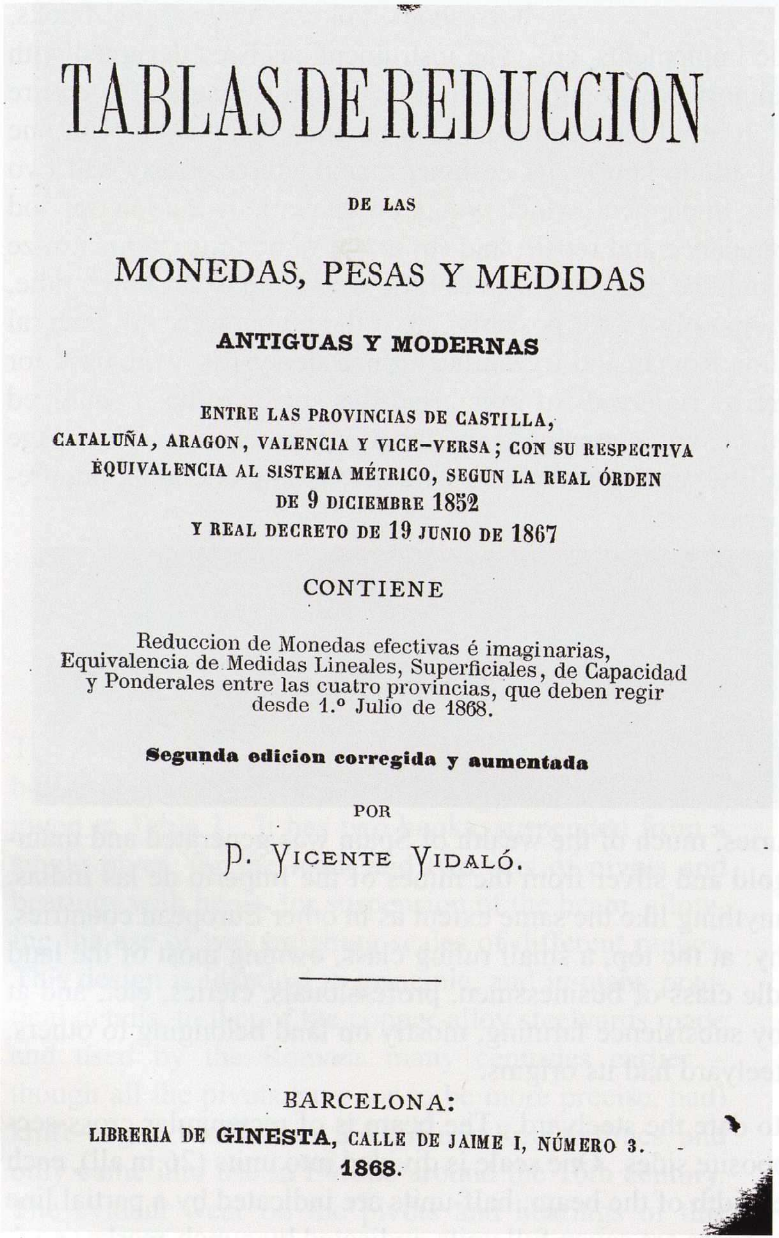


Figure 4.

Until the 19th century, the weight systems used in Spain were (as in other European countries) based on the ancient Roman system of pounds and ounces. The absolute mass of the units varied from one region to another; and in some regions, the pound was divided into 12 ounces, while in others, it was 16 ounces. The first attempts at introducing a uniform system of measurement were made early in the 1800's, while Joseph Bonaparte was King of Spain; but (as happened in other European countries, including France itself) the full implementation of metric units throughout Spain was not completed until more than 50 years later. I have beside me a handbook, or ready reckoner, published in Barcelona in 1868 (Fig. 5), which gives (besides a great deal of other comparative data) the metric equivalents of four different regional weight systems: Castile, Aragon, Catalonia, and Valencia.


TABLAS DE REDUCCION

DE LAS

MONEDAS, PESAS Y MEDIDAS

ANTIGUAS Y MODERNAS

ENTRE LAS PROVINCIAS DE CASTILLA,
CATALUÑA, ARAGON, VALENCIA Y VICE-VERSA; CON SU RESPECTIVA
EQUIVALENCIA AL SISTEMA MÉTRICO, SEGUN LA REAL ÓRDEN
DE 9 DICIEMBRE 1852
Y REAL DECRETO DE 19 JUNIO DE 1867

CONTIENE

Reduccion de Monedas efectivas é imaginarias,
Equivalencia de Medidas Lineales, Superficiales, de Capacidad
y Ponderales entre las cuatro provincias, que deben regir
desde 1.º Julio de 1868.

Segunda edicion corregida y aumentada

POR

D. VICENTE VIDALÓ.

BARCELONA:
LIBRERÍA DE **GINESTA**, CALLE DE JAIME I, NÚMERO 3.
1868.

Figure 5.

To determine the units in which this steelyard is graduated, calibration was necessary. This involved setting up the steelyard in operating mode, placing the cursor successively at various points along the scale, and balancing it at each point with known weights. This was not easy: with its worn knife-edges and rusted bearings (Fig. 2), the steelyard has become very insensitive. Without going into detail , I can report that the lighter scale is graduated in ounces (onzas) of about 33 g (and half-ounces), and the heavier scale in twelve-ounce pounds (libras) of about 400 g; a result which leaves no doubt that the steelyard was designed for the weight-system which was used in Catalonia, before the introduction of the metric system. Its full range is from 1 ounce to 7 pounds (a little less than 3 kg).

One thing remains to be said: The sole non-functional feature of this steelyard is in the design of the two rods, which connect the load hooks to the beam. Each of these, rather than being left a plain straight bar, has been carefully shaped by its maker into an elegant spiral. This small, entirely gratuitous act is (in my view) an aesthetic tour de force, which eloquently expresses the craftsman's pride in his skill, and the satisfaction he must surely have found in producing such a graceful instrument.

Notes & References

1. On each of the two scales, there are anomalous punch-marks: on the light scale, at 23 ounces (two dots), and on the heavy scale, at 1 pound (4 dots). I have no explanation for these: they may have had to do with the original calibration of the instrument.

2. The calibration process made me think long and hard about the problems involved in producing a steelyard with two scales – especially one of iron. For anyone who is interested, and writes to me, I can provide full details and results of my calibration procedure.

Almost Instant Gratification

BY JAN BERNING

One day, several years ago, as I was looking through the USpto.gov website at scales, I found a unique implement patent number 2,507,073 entitled *Letter Scale* (Figure 1). The web site had recently become available for searching online and I had discovered how to search for only scale patents. The patent intrigued me; particularly the curves which appealed to the artistic side of my life. I read the patent text and learned that several tools were incorporated in its design. Not only was it a letter scale as the title read, but it included a one foot *ruler, protractor, compass, level, French curves, and magnifier.*

A favorite subset of scales in my collection is letter-opener scales and I felt there was a possibility that this letter scale incorporated a new style to add to the group already in my possession. I had letter-opener scales incorporating a magnifier, but had never seen a scale meeting this description, let alone one that had several tools in its design. Were these ever manufactured?

I printed the patent and shared it with my husband Bill, stating *You can find me one of these, someday!*

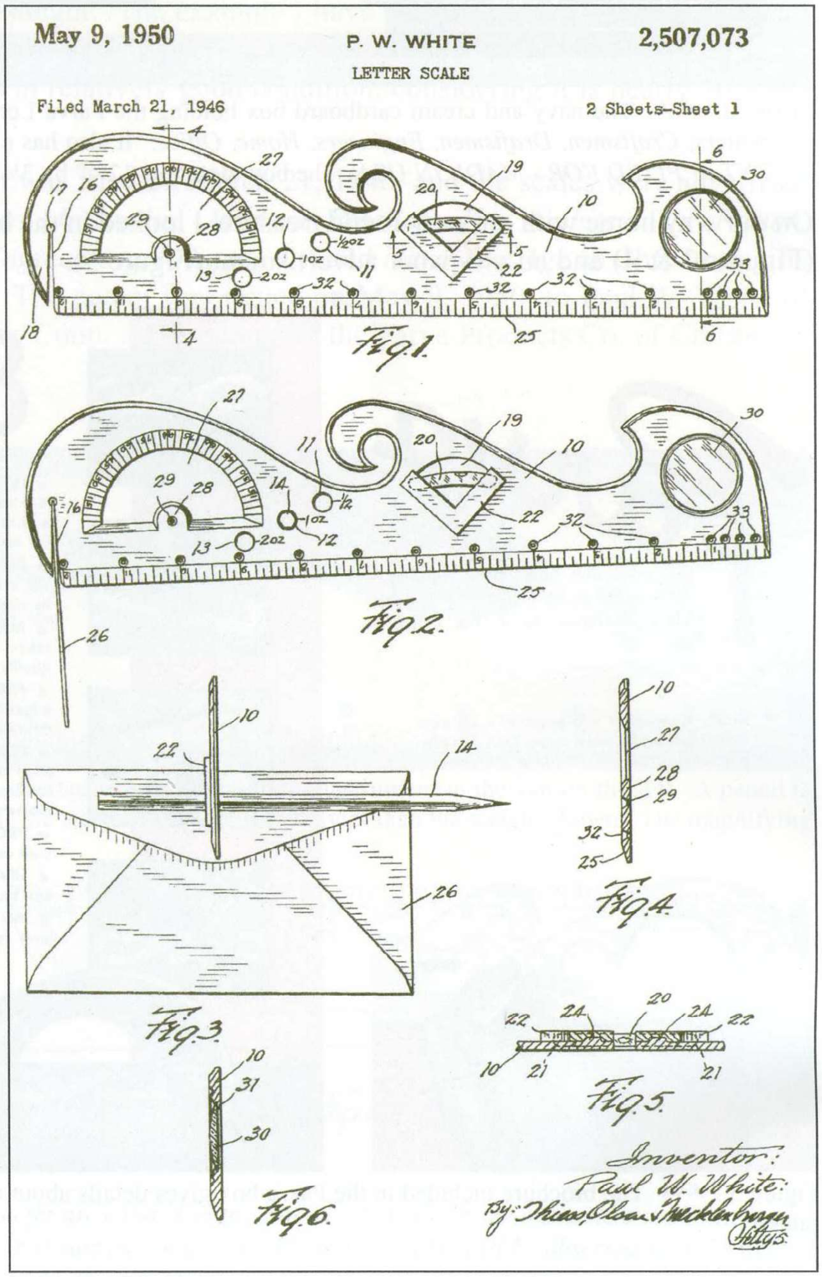


Figure 1. ➤➤ Patent number 2,507,073 was applied for on March 21, 1946 and issued on May 9, 1950, to Paul W. White of New Haven, Connecticut. It was assigned to the Parva Products Co. of Chicago, Illinois.

Later that day, we decided to make a trip to the two large antique malls in the nearby city of Rockford. The malls were open until 9 p.m., giving us plenty of time to browse through both of them. Our standard procedure is to look around the perimeter of an antique shop, mall or show and continue down each aisle until we have seen everything. As we were nearing the back of the mall, Bill reached down and picked up an item. He tried to hide it so that I couldn't see what he had found, but my persistence paid off and he showed me the box in figure 2. I asked if there was an object in the box because I couldn't believe that he had found one of these tools so soon after I discovered its possible existence!

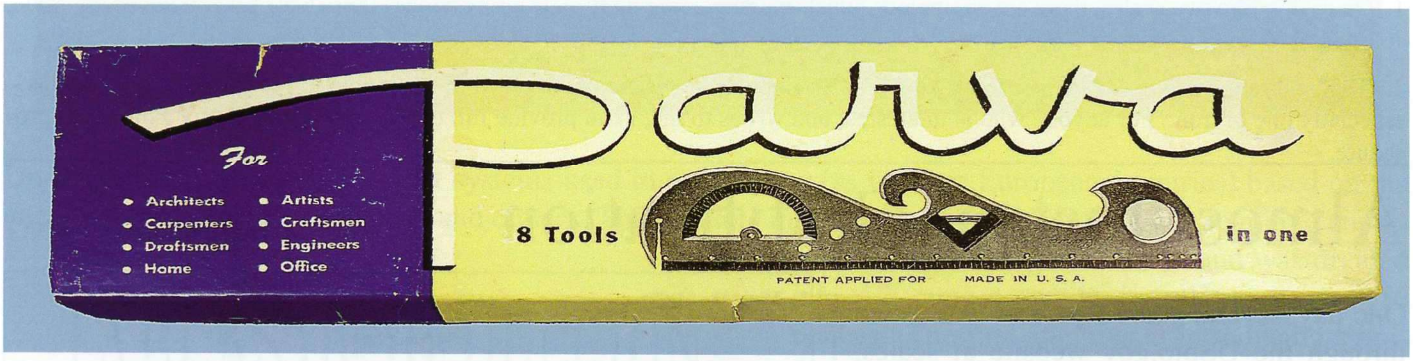
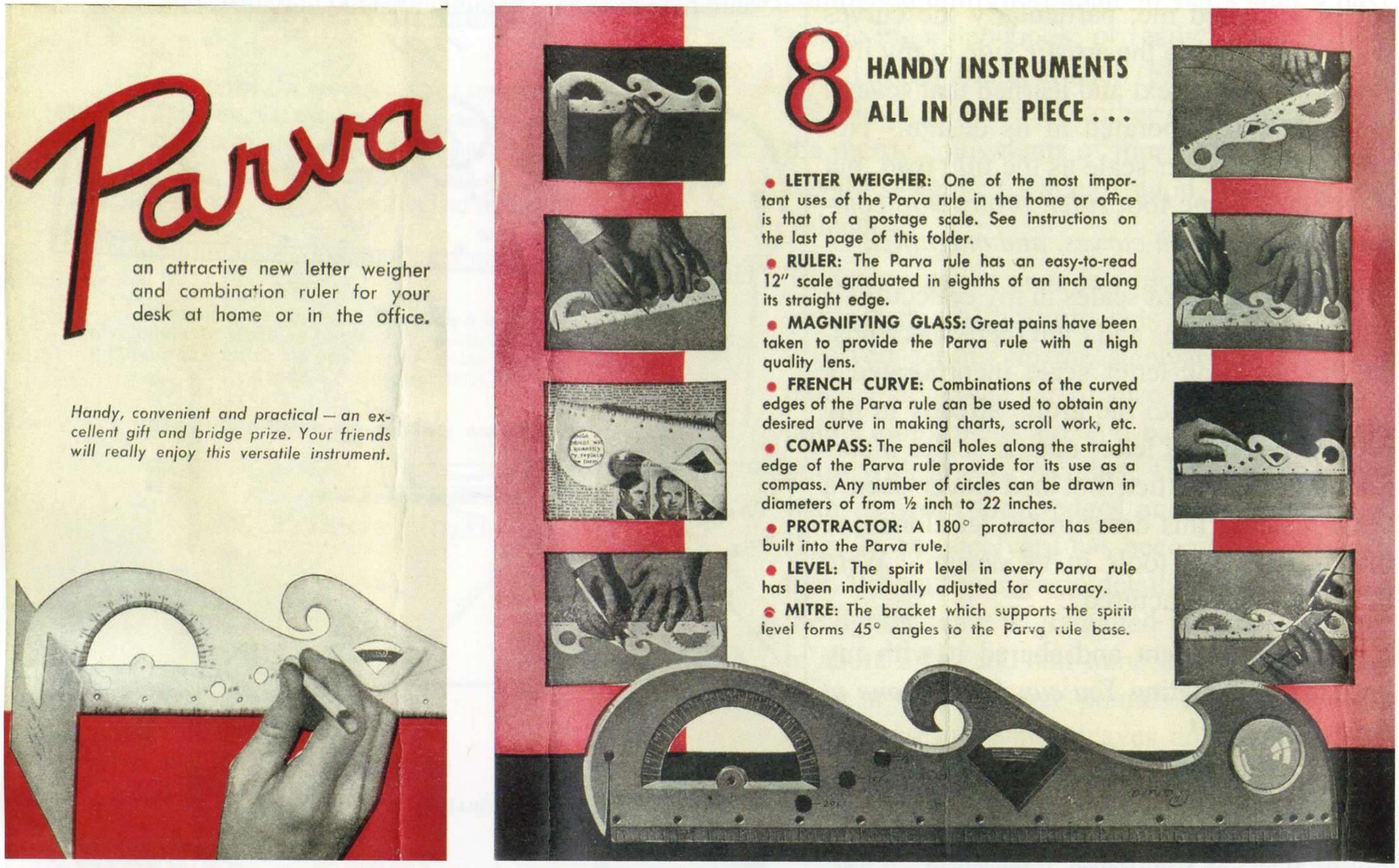


Figure 2. The navy and cream cardboard box holding the Parva Letter Scale reads *8 Tools in one. For Architects, Artists Carpenters, Craftsmen, Draftsmen, Engineers, Home, Office.* It also has a picture of the tool on its front below which is printed *PATENT APPLIED FOR - MADE IN USA*. The box measures 12¾" by 3¼" and is ½" deep.

On our way home with our new found treasure, I looked in the box and found, along with the scale, a brochure (Figures 3 & 4) and an old paper advertisment (Figure 5).



Parva

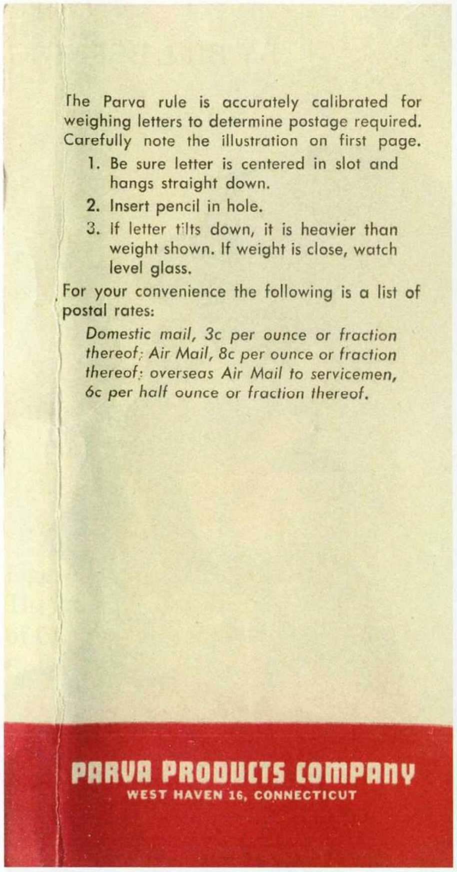
an attractive new letter weigher and combination ruler for your desk at home or in the office.

Handy, convenient and practical — an excellent gift and bridge prize. Your friends will really enjoy this versatile instrument.

8 HANDY INSTRUMENTS ALL IN ONE PIECE . . .

- **LETTER WEIGHER:** One of the most important uses of the Parva rule in the home or office is that of a postage scale. See instructions on the last page of this folder.
- **RULER:** The Parva rule has an easy-to-read 12" scale graduated in eighths of an inch along its straight edge.
- **MAGNIFYING GLASS:** Great pains have been taken to provide the Parva rule with a high quality lens.
- **FRENCH CURVE:** Combinations of the curved edges of the Parva rule can be used to obtain any desired curve in making charts, scroll work, etc.
- **COMPASS:** The pencil holes along the straight edge of the Parva rule provide for its use as a compass. Any number of circles can be drawn in diameters of from ½ inch to 22 inches.
- **PROTRACTOR:** A 180° protractor has been built into the Parva rule.
- **LEVEL:** The spirit level in every Parva rule has been individually adjusted for accuracy.
- **MITRE:** The bracket which supports the spirit level forms 45° angles to the Parva rule base.

Figure 3. The brochure included in the Parva box gives details about each of the tools or instruments that the Parva incorporates.



The Parva rule is accurately calibrated for weighing letters to determine postage required. Carefully note the illustration on first page.

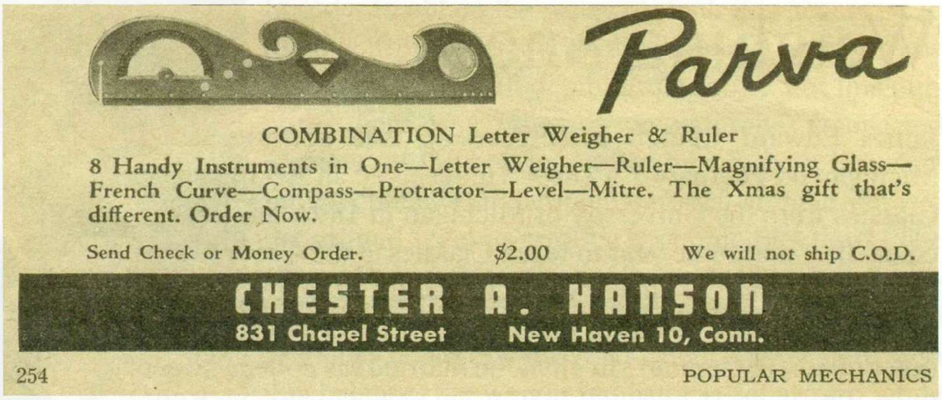
1. Be sure letter is centered in slot and hangs straight down.
2. Insert pencil in hole.
3. If letter tilts down, it is heavier than weight shown. If weight is close, watch level glass.

For your convenience the following is a list of postal rates:

Domestic mail, 3c per ounce or fraction thereof; Air Mail, 8c per ounce or fraction thereof; overseas Air Mail to servicemen, 6c per half ounce or fraction thereof.

PARVA PRODUCTS COMPANY
WEST HAVEN 16, CONNECTICUT

Figure 4. ⮝⮝ The back of the brochure explains how to use the letter scale and shows the manufacturer.



Parva

COMBINATION Letter Weigher & Ruler

8 Handy Instruments in One—Letter Weigher—Ruler—Magnifying Glass—French Curve—Compass—Protractor—Level—Mitre. The Xmas gift that's different. Order Now.

Send Check or Money Order. $2.00 We will not ship C.O.D.

CHESTER A. HANSON
831 Chapel Street New Haven 10, Conn.

254 POPULAR MECHANICS

Figure 5. ⮝⮝ This advertisement appeared in the November 1946 issue of *Popular Mechanics* Magazine.

The Parva is made from cream colored plastic and measures 12¼" long by 2¾" in height. The example I have is slightly bowed, probably from heat in an attic years ago. The box still bears its $2.00 selling price on its end and is in relatively good condition, considering it is nearly 70 years old.

The patent was filed on March 21, 1946, and the scales were advertised in *Popular Mechanics, Modern Plastics, The Architectural Forum, Product Engineering, Printer's Ink* and *Hardware Age* as Christmas gifts that year. The patent was issued on May 9, 1950, to Paul W. White of New Haven Conn. and assigned to the Parva Products Co. of Chicago.

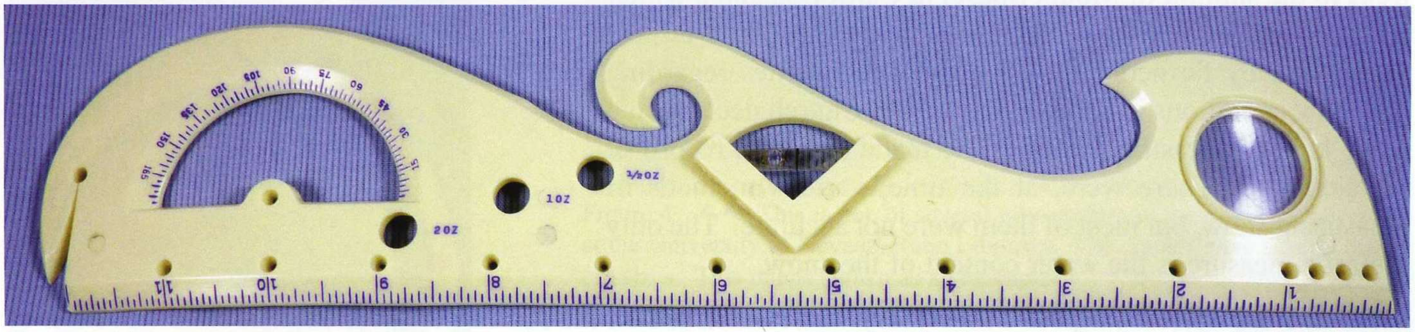


Figure 6. ⮝⮝ To use the letter scale, the envelope is inserted perpendicular to the instrument in the slot on the left. A pencil is inserted in the ½ oz, 1 oz or 2 oz hole near the center. If the letter tilts down, it is heavier than the weight shown. The magnifying glass is on the right and the spirit level is at center.

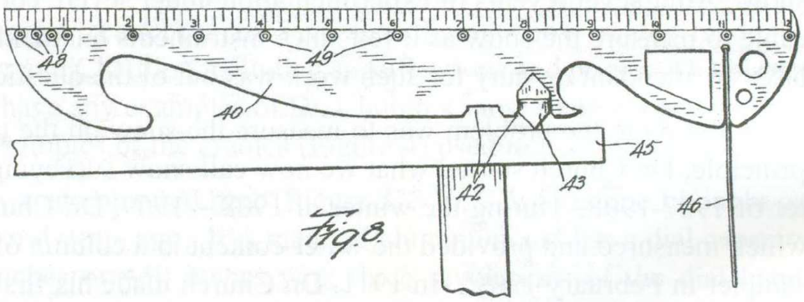


Figure 7. ⮞⮞ In the other version, shown in the patent *the body member 40 is provided with a plurality of notches 42 for receiving a separate knife-edged fulcrum element 43 which is provided with a pair of spaced, upwardly extending arms for receiving the body when it is desired to use the instrument as a letter weigher. The notches 42 serve to position the fulcrum element 43 longitudinally of the scale beam or body member 40, and it will be understood that these notches are properly located so as to provide for balancing the instrument when letters of predetermined weight are carried in the slot 41. In figure 8 the instrument is shown in use as a letter weigher, the fulcrum element 43 resting on a flat surface such as a table top 45 and it will be observed that the weight of the letter has caused the left-hand end to rise off the table, thereby indicating that the letter 46 is slightly overweight.*

Weighing Snow

BY BILL BERNING

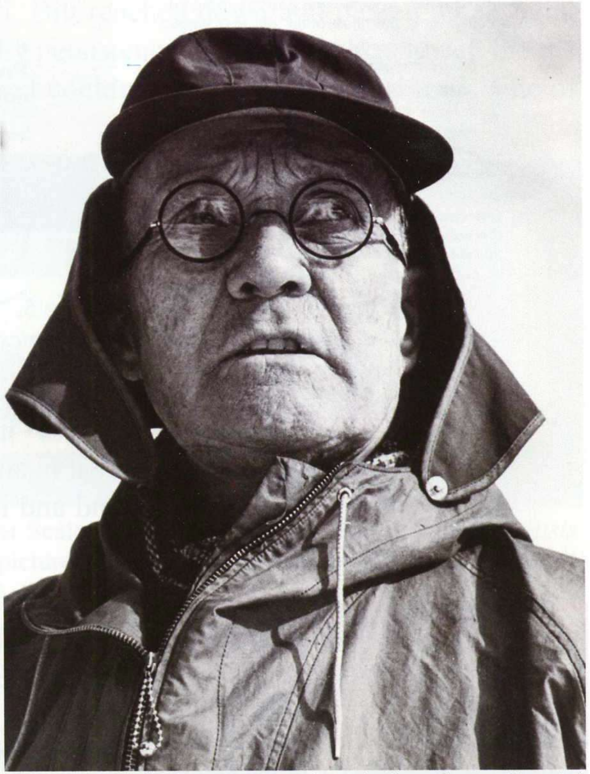


Figure 1. ▲▲ Dr. James Edward Church, Jr. Special Collections, University of Nevada, Reno Libraries.

James Edward Church Jr (Figure 1), was born in Holly, Michigan on February 15, 1869. He received an AB Degree in Classics from the University of Michigan in 1892, and accepted an offer that same year to teach Classics at the University of Nevada, Reno. There Church taught courses in the Appreciation of Literature, Beauty of Art and Nature in addition to Latin & German. In 1894, he married his college sweetheart Florence Humphrey and they had two sons, Willis Humphrey and Donald E. Church[1].

Church returned to Michigan from 1898 to 1899 to work on a graduate degree and then attended the University of Munich from 1899 to 1901, where he was awarded his Ph.D. The Churches returned to Reno, Nevada, in 1901, where he taught Classics and Art History until his retirement in 1939.

Dr. Church grew to love the community of Reno. He was particularly fascinated by the Sierra Nevada Mountains, so utterly different from the terrain of his native Michigan. In 1895, he made his first mid-winter ascent of Mount Rose. Florence often accompanied him on his mountain climbs. The Churches were members of the Sierra Club and published their adventures in the club's bulletin. Their published accounts tell of treks to the summit of Mount Shasta in California and a winter climb of Mount Whitney. Each time, upon his return, he was questioned by farmers and other interested parties regarding the snow conditions in the mountains. Dr. Church decided that some kind of measurement must be made to give a record of his findings. There were, at the time, various methods of measuring snow, but most of them were not accurate. The only inelastic measure is the water content of the snow.

The Mt. Rose Meteorological Observatory was established on the summit of the mountain at an elevation of 10,800 feet above sea level to make an accurate detailed study of the weather and particularly of snowfall. Here Dr. Church experimented with various types of instruments to measure the precipitation in the form of snow. After several years of experimentation under severe conditions, it was concluded that it was impracticable to measure the snow as it fell since instruments unattended for long periods failed to get results and to have an attendant on duty for such work was out of the question.

The solution to the problem was to measure the snow on the ground at the end of the winter. Based on this principle, Dr. Church started what we now call snow surveying[2]. The first surveys were made over the winter of 1907-1908. During the winter of 1908 – 1909, Dr. Church developed the Mount Rose snow sampler, which measured and provided the water content in a column of snow. He announced the development of the sampler in February 1909[3]. In 1911, Dr. Church made his first forecast of streamflow based upon these surveys. Since that time, snow surveying has spread to all regions of the western United States.

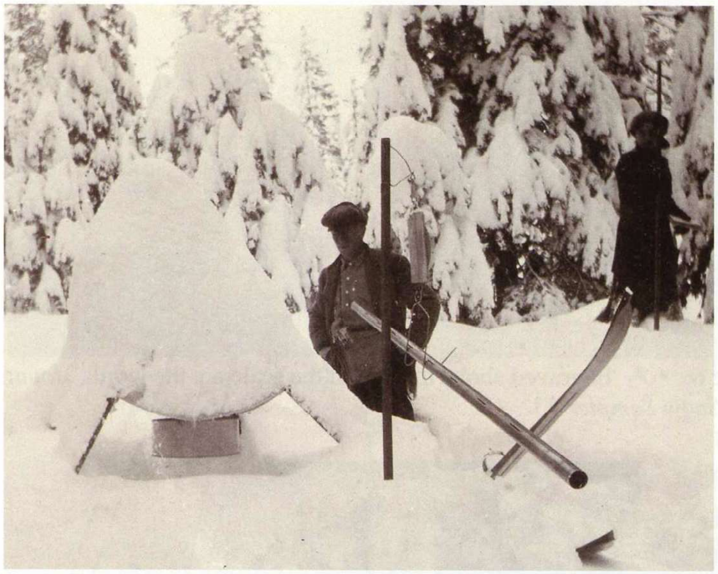


Figure 2. ▲▲ Dr. Church using the Mt Rose Snow Testing Scale. The scale holding the sampler tube is hanging from a pole in front of Church. His wife Florence stands in the background. Special Collections, University of Nevada, Reno Libraries.

In order to obtain the water content, it is necessary to remove, from the snow on the ground, a core of snow representing the full depth of the snow. For this purpose, there is a tube, or several tubes connected together, at the bottom end of which there is a steel milled cutter. This sampler is driven into the snow to the ground level to retrieve a sample of snow[4]. The Mount Rose balance is the dial type, especially graduated so that the weight of the snow core is indicated as inches depth of water. To weigh a snow core with this balance, the weight indicator is set at zero while the empty sampler is on the balance. This adjustment is made by turning the knurled nut near the top of the face of the instrument. Tare thus having been detemined, the net weight of the snow core is the weight procured when the sampler, with enclosed snow core, is placed on the balance[5].

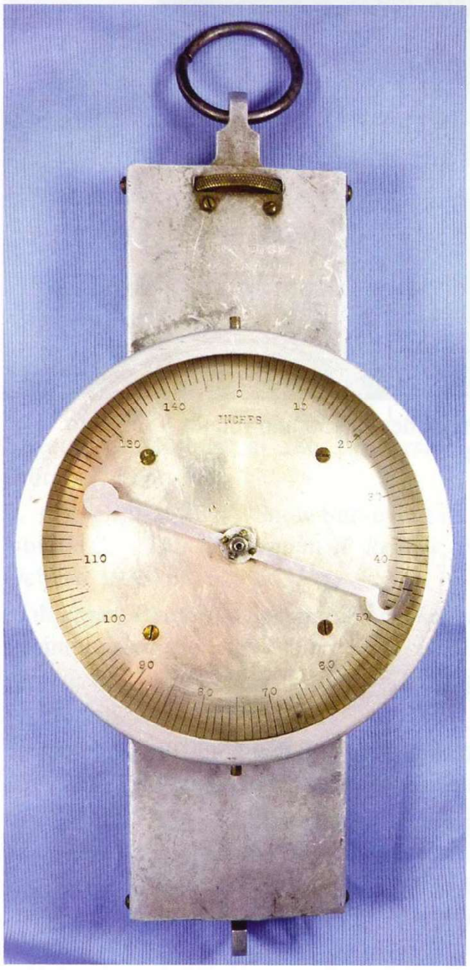


Figure 3. ▲▲ The snow sampling scale in the author's collection is made of aluminum and is graduated in inches from 1 to 150 by one inch.

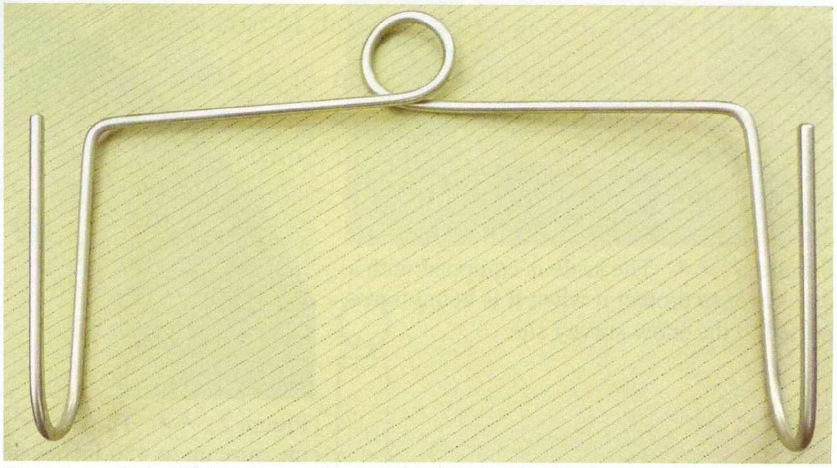
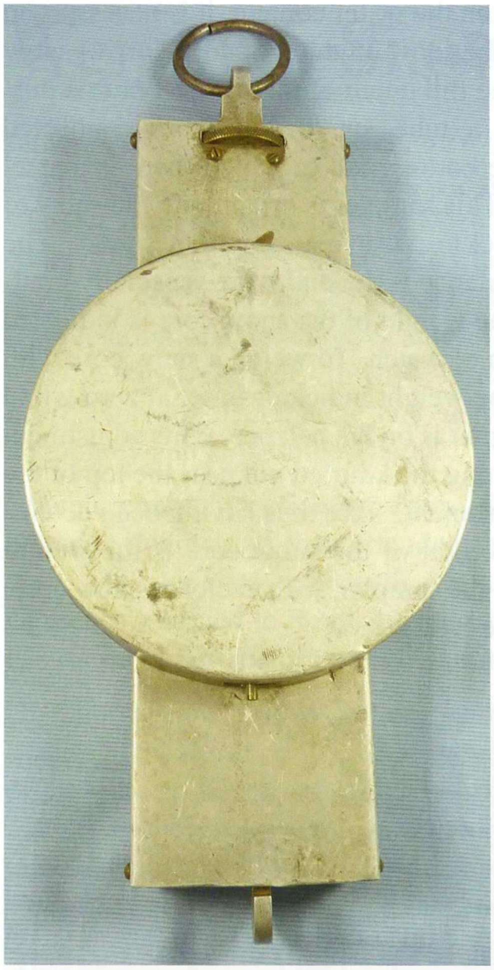


Figure 4. ▲▲ This is one of several tube cradles in the Special Collections at the University of Nevada, Reno Libraries. The cradles were several different sizes. This one is shown as an example.

In the papers of James Edward Church at the University of Nevada are several vague references to several different snow scales made by Forschner and Chatillon including specifications and prices. The library does not have any examples of Dr. Church's snow scales. They do have several examples of the cradles (Figure 4) used to hold the sampler.

The snow scale pictured here (Figure 3, 5, 6, 7 & 8) is one I bought on Ebay several years ago. It is made of aluminum and has a dial capacity of 150 inches or 450 inches with three revolutions of the dial hand. Engraved above the face on the front of the scale is "MOUNT ROSE SNOW SAMPLER 13". It also has the twist on dial cover to protect the face as it has no glass over it. The cradle is missing from this scale.



Fiigure 5. ⮝⮝ The scale is equipped with a dial cover to protect it when it is being transported to the snow survey site.

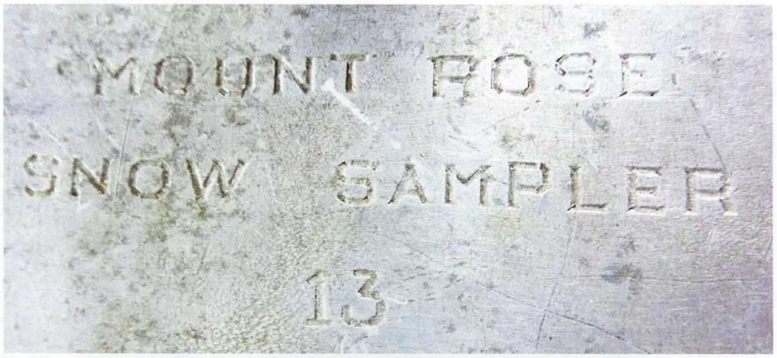


Figure 6. ⮝⮝ Engraved above the dial of the scale are the words *Mount Rose Snow Sampler 13*.

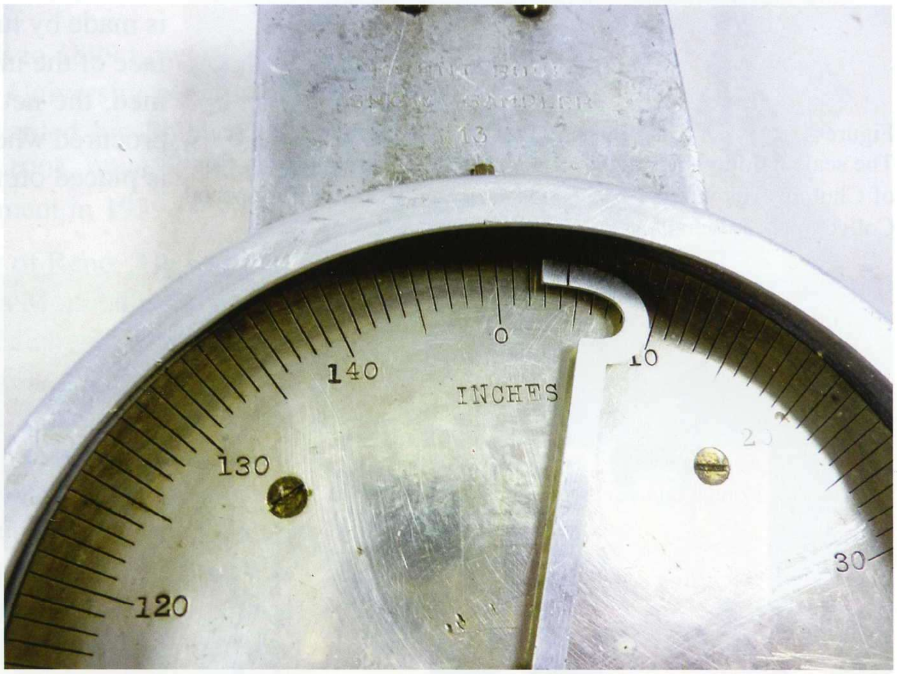


Figure 7. ⮝⮝ The dial is graduated in inches to 150 and rotates 3 times to measure up to 450 inches of snow pack.

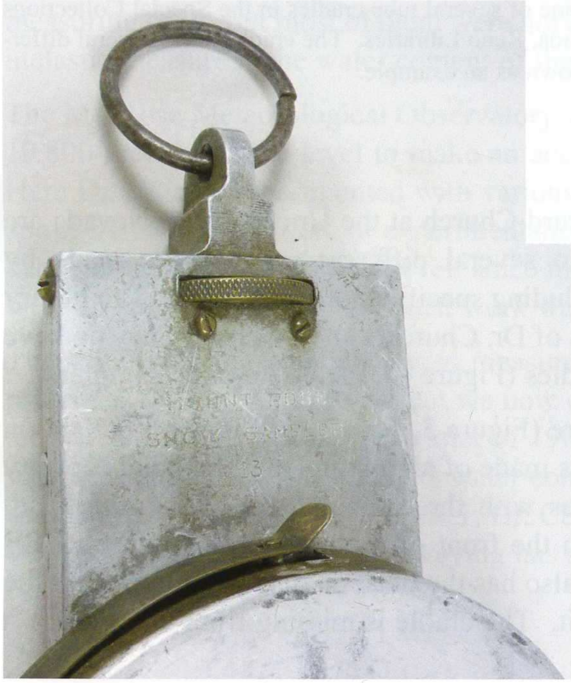


Figure 8. ⮜⮜ In this photo you can see the clip that holds the dial cover on as well as the knurled knob to adjust the tare.

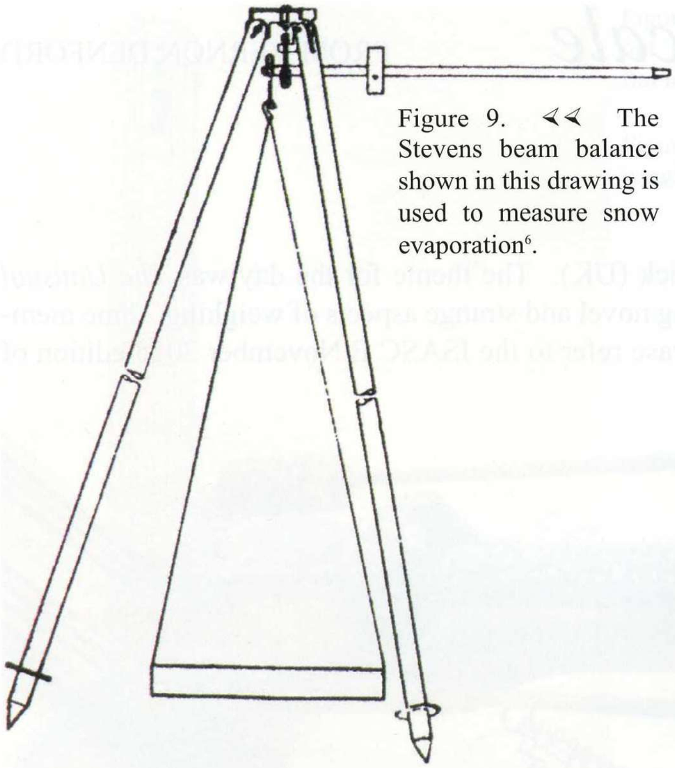


Figure 9. ≺≺ The Stevens beam balance shown in this drawing is used to measure snow evaporation[6].

Federal snow sampling equipment differs from Mt. Rose snow sampling equipment. Mt. Rose uses a sampler with a snow cutter with an inside diameter of 1.5 inches. This size requires a special scale graduated in inches. The Federal sampler (Figure 10) uses a snow cutter with an inside diameter of 1.485 inches. With this cutter a scale graduated in pounds and inches is used.

In a section of the June 1940 United States Department of Agriculture Snow Surveying Publication number 380, it describes the care of equipment as follows: *The balances should frequently be tested for accuracy. They should weigh accurately to one-half division; if they do not, they should be returned for replacement. They should be well protected while being transported and while in storage, carefully handled while in use, and wiped clean and dry after each use*[5]. The price listed in this publication for a balance is $9.17. This is the actual cost of the scale purchased in quantity.

In addition to determining the water content of the snow on the ground, another factor to consider is evaporation as the snow sits on the ground for the season. One method used to determine the rate of evaporation is with evaporation pans. These pans are weighed at regular intervals to determine evaporation. The Stevens beam balance (Figure 9) is one type of scale that can be used for this operation.

Dr. Church's snow measuring techniques are still being used today.

References:

1. The Papers of James Edward Church, Collection NC96, Special Collections at the University of Nevada, Reno Libraries, Reno, NV.

2. Church, J. E., Dr, "Snow Surveying its principles and possibilities". *The Geographical Review*, Vol XXIII, No. 4, October 1933, pp. 529-563.

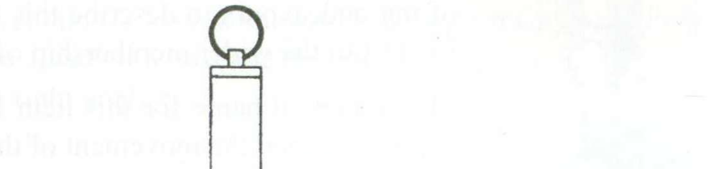
3. Mergan, Bernard, "Seeking Snow: James E. Church and the beginnings of the snow science". *Nevada Historical Society Quarterly,* Vol. 35, No. 2 (Summer 1992). pp 80.

4. Church, J. E., Dr., ibid.

5. Mare, James C., "Snow Surveying", *USDA Publication No. 380,* June 1940, pp 10-11, 14.

6. Church, J.E., "Exhibit and Discussion of Apparatus for Measuring Snowfall and Snowcover, both Accumulation and Evaporation", *International Geodetic and Geophysical Union. Association of Science Hydrology. Bulletin. No.23*, 1938. pp 749-754

Figure 10. ➤➤ This is a drawing of the Federal snow-sampling equipment using a spring balance. This system uses a balance graduated in pounds and ounces as well as a different size sampler tube and cutter[5].



My Unusual *Abacus Scale*

FROM VERNON DENFORD

Notes & Queries

N & Q No. 162

In October 2015, ISASC(E) held a meeting near Warwick (UK). The theme for the day was *The Unusual Weigh*. Members were encouraged to bring to the meeting novel and strange aspects of weighing, some members spoke about unusual scales in their collections. Please refer to the ISASC E November 2015 edition of *Fulcrum.**

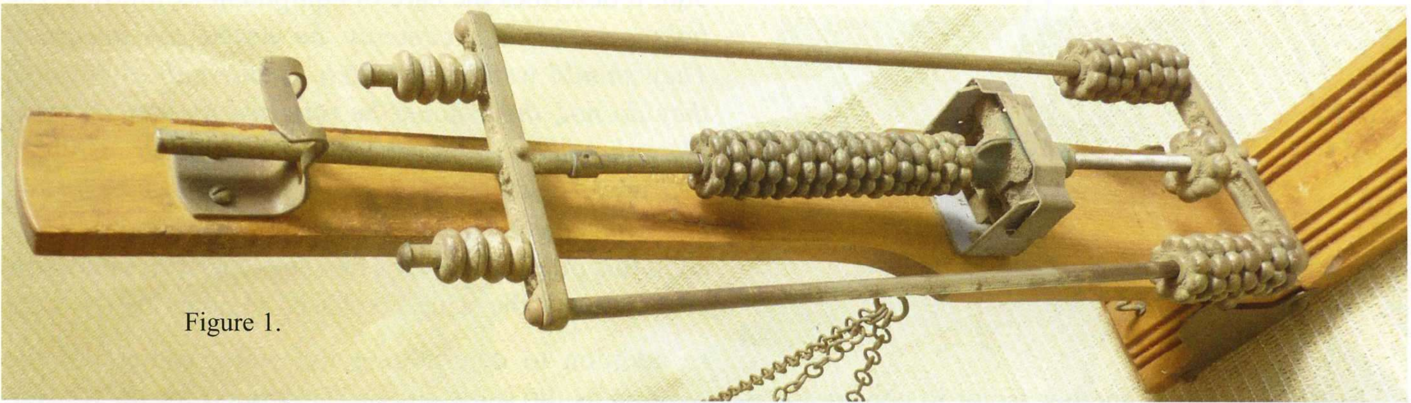
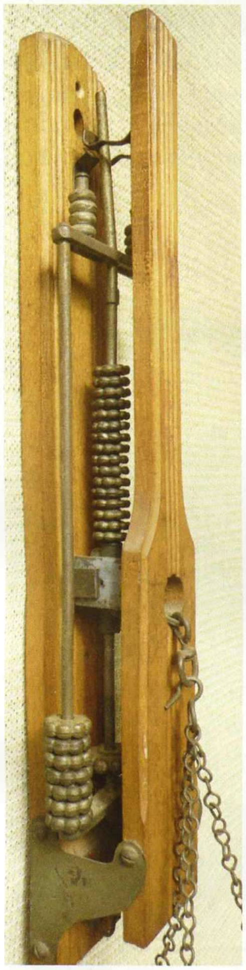


Figure 1.

Figure 2. ▼▼ Folded.



Being unable to travel from Australia for this meeting prompted me to make a contribution of a particular scale in my collection. I consider my *Abacus Scale* fits into the category of unusual.

My contribution unfortunately did not make it to the UK forum. However, on completion of my endeavours to describe this scale, it has been suggested that perhaps it will be of interest to the wider membership of ISASC through EQM.

My colloquial name for this item is an *Abacus* Scale, simply because the layout of the mechanism and the movement of the counterpoises is in a similar fashion to the use of an abacus. In this case, equilibrium is the objective, which convinces me to consider it as unusual.

I describe this scale as a 5 beam steelyard (can you have a steelyard with 5 beams?) with a balancing counterpoise on the central rear beam, the other counterpoises which are proportional weights, being 8 by 1/8 oz on the front 2 beams, 16 by 1 oz on the central beam and 12 by 1 lb counterpoises on the 2 outer beams. The total capacity of the scale, less any tared container which may be used, is 13 lbs 1 oz.

The unloaded scale mechanism and weight system is shown in Figure 1.

The gallows and beam arrestment guard at the front of the mechanism base board doubles as a latch to catch on a clip on the wooden upright when the scale is folded to the wall or post.

The dimensions of the wooden back board are 20½ inches by 2¾ inches by 7/10 inches (520 mm x 70 mm x 19 mm). The mechanism base board is 18¾ inches x 1½ inches (smaller width) x 7/10 inches (476 mm x 38 mm (smaller width) x 19 mm.

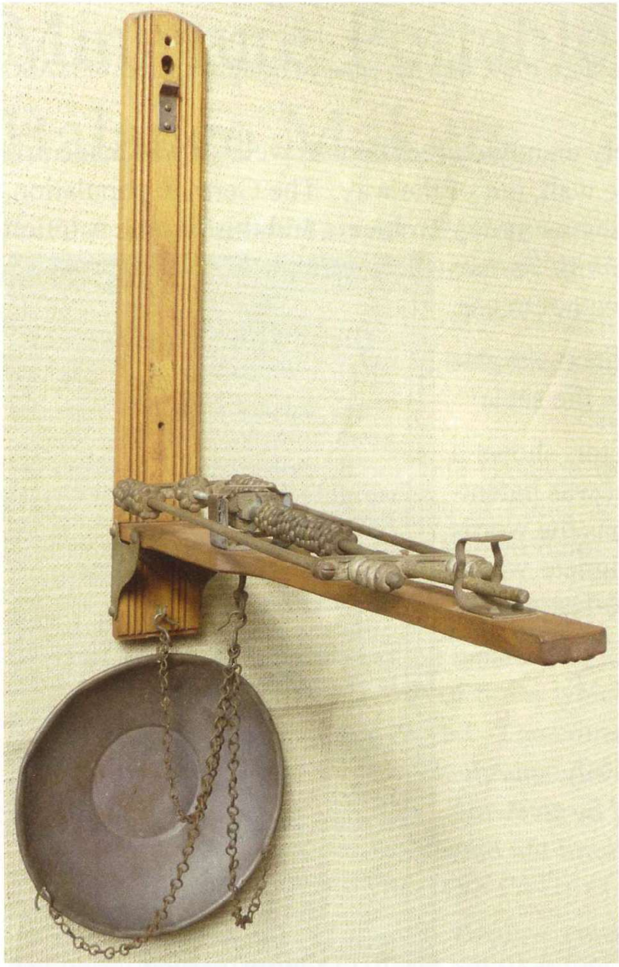
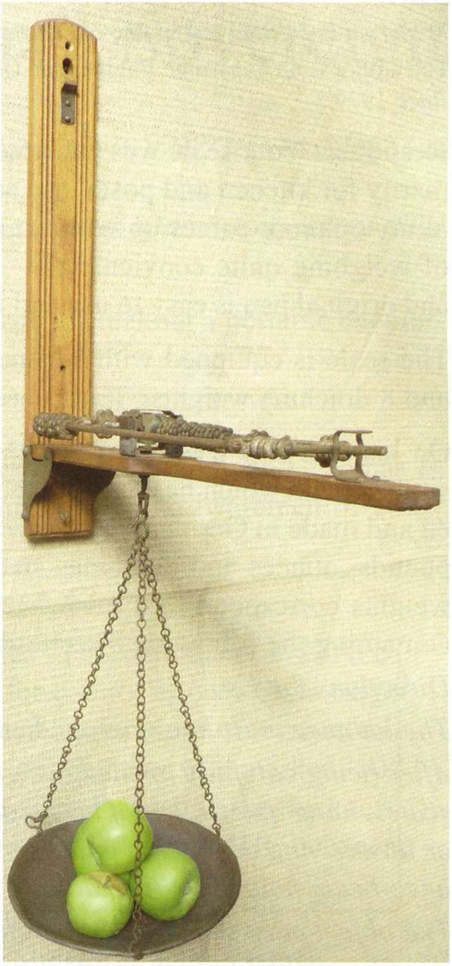


Figure 3. ≺≺ Scale folded out showing how pan folds flat to wall when not in use.

Figure 4. ≻≻ Scale ready for weighing.



The sequence of operating the scale from folded to weighing a load is shown in the accompanying photographs figures 2 to 5. It is designed to be suspended on a wall or a post and the pan and suspension chains to be released and the beam base board folded down to a right angle ready for use.

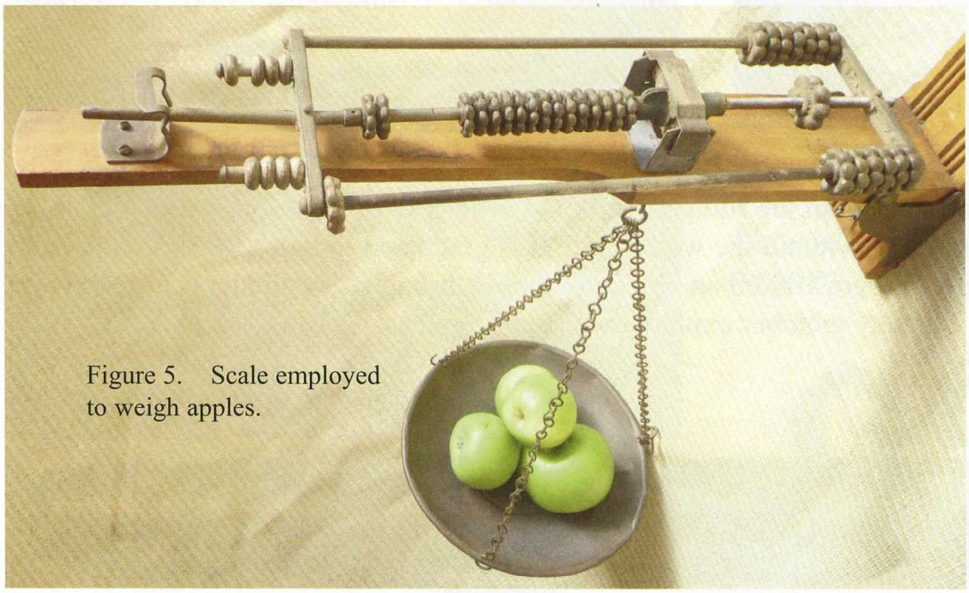


Figure 5. Scale employed to weigh apples.

Zero balance and tare, if required, is achieved by adjusting the counterpoise on the central rear screw beam with all other counterpoises pushed to the rear of their respective beams.

The scale is quite sensitive and when balanced at 10 lb the beam will turn with a ¼ oz weight added.

This scale was purchased in Melbourne, Australia but I have no clues as to the inventor or manufacturer, or of its place of origin.

Can anyone describe the type or principle of this scale mechanism in a better way, or assist in identifying the maker and origin of this *unusual* scale please?

Notes:

**Fulcrum* is currently available online on at the ISASCE.com web page.

The author is an expatriate Englishman (Bristolian), a resident in Australia since 1969, who has enjoyed being a member of ISASC since 1979.

Response: Your scale was patented in Germany and most likely manufactured there as well. It was made primarily for kitchen and postal use as it folded neatly against the wall, out of the way. The German population, in my opinion, comes up with some brilliant methods of solving everyday problems and this fits the solution of weighing quite convieniently. This three beam steelyard with its tare and original pan is easy to use and folds up, out of the way when not in use.

The scale is equipped with 14 one pound weights, 16 one-ounce weights and 8 drachma weights. It also has an adjusting weight to tare the scale

On his web site www.s-a-w.net, Matt Hass, a German collector, shows a similar scale which has a manufacturer's stamp showing that it was patented and made in Germany by the Wi Wa Company. His scale has the words pounds, ounces and drachmas stamped along its side to designate which weights correspond to a given weight. In addition, his scale has a label containing the following directions:

Directions for Use.

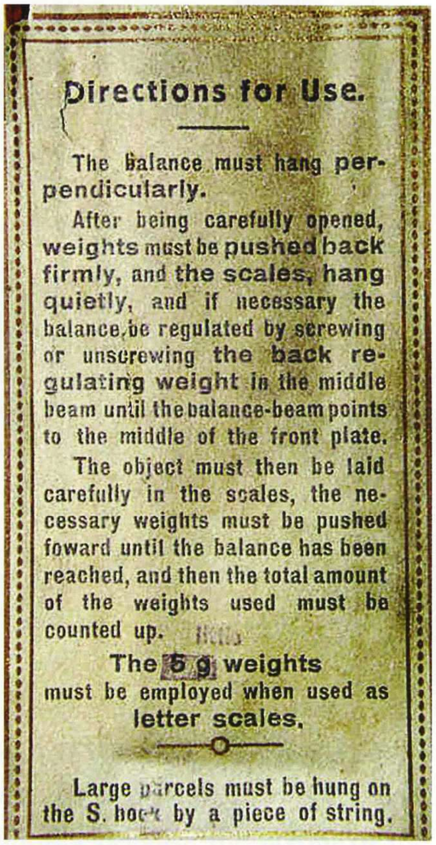
The balance must hang perpendicularly.

After being carefully opened, weights must be pushed back firmly, and the scales, hang quietly, and if necessary the balance be regulated by screwing or unscrewing the back regulating weight in the middle beam until the balance-beam points to the middle of the front plate.

The object must then be laid carefully in the scales, the necessary weights must be pushed forward until the balance has been reached, and then the total amount of the weights must be counted up.

The 5 g weights must be employed when used as letter scales.

Large parcels must be hung on the S hook by a piece of string.



Directions for Use.

The balance must hang perpendicularly.

After being carefully opened, weights must be pushed back firmly, and the scales, hang quietly, and if necessary the balance be regulated by screwing or unscrewing the back regulating weight in the middle beam until the balance-beam points to the middle of the front plate.

The object must then be laid carefully in the scales, the necessary weights must be pushed foward until the balance has been reached, and then the total amount of the weights used must be counted up.

The 5 g weights must be employed when used as **letter scales.**

Large parcels must be hung on the S. hook by a piece of string.

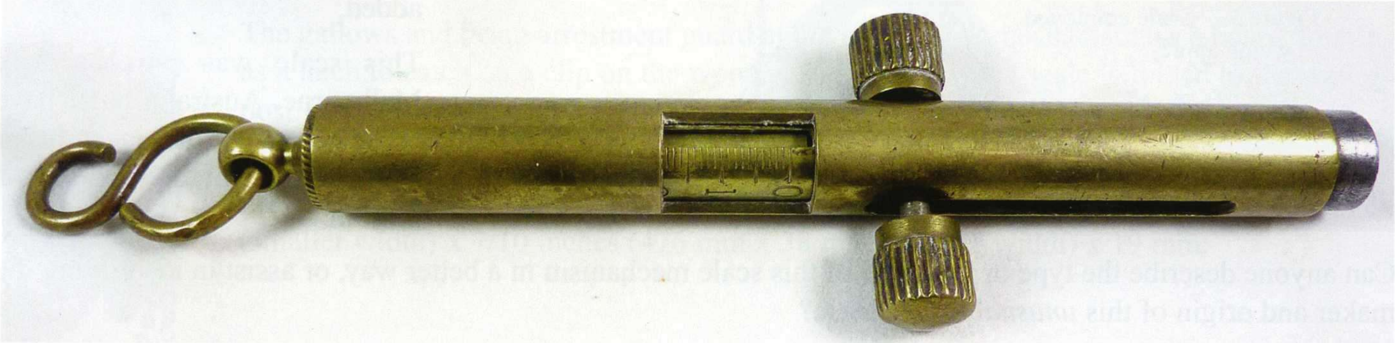
Jan Berning

Notes & Queries

FROM BILL BERNING

N & Q No. 163

The spring balance shown here is an item from the John & Virginia Cattle collection. A brass cylinder scale, with no name or markings, it measures 6" without the wire hook. It is graduated in Kilograms by 10ths to 5 and is ½" in diameter. Two knurled knobs are affixed on a steel rod going through the cylinder center. Pulling on these knobs engages the scale. Can any member explain the use of this scale or know the maker's name?



Miniature Portable “Brass Box” Sovereign Balance Makers

BY MICHAEL FOSTER

Paine & Simpson and Thomas Wood were two London sovereign balance makers who distinguished their product offering by making distinctive Portable Brass box rocker scales.

Paine & Simpson and Thomas Wood of London took very different approaches to making a portable counterfeit sovereign coin detector but in both cases they used a “Brass Box” approach.

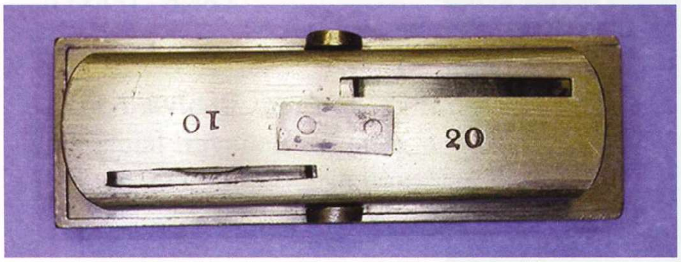
Paine and Simpson

The first style of miniature portable Balance found in a brass box was made by John Paine and Thomas B. Simpson, under the business name of Paine & Simpson, Comb manufacturers and Hardwaremen of 29-31 High St., Borough. London, from known dates 1816 to 1838.

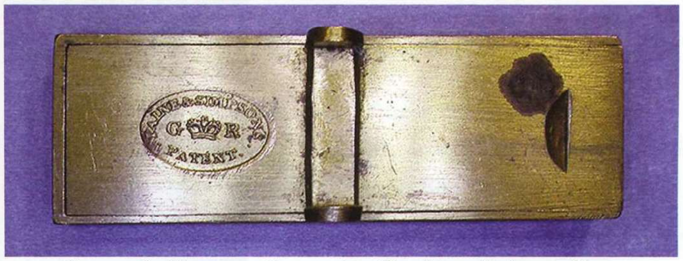
Their non-standard sovereign rocker is described in Sheppard and Musham on p.149:

> No. 302 - Small patent rocking balance for sovereigns and half-sovereigns. This consists of a neat rectangular box (2 ½ X 5/8 in.) of brass which when placed in position for use rocks on a brass ridge crossing the upper side of the lid. The coins are pushed up towards a rectangular piece of brass in the centre of the beam, on one side marked ‘20’, for weighting sovereigns, on the other side marked ‘10’ for weighing half-sovereigns. The beam is perforated on the respective sides for testing the thickness of sovereigns and half-sovereigns. On the lid is an oval stamp of a crown and the letter G.R. between the words ‘PAINE & SIMPSONS PATENT’.

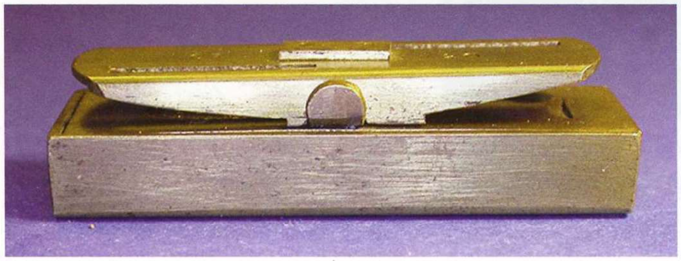
The only recorded example of this small patent Rocking Balance is shown in the following photos:



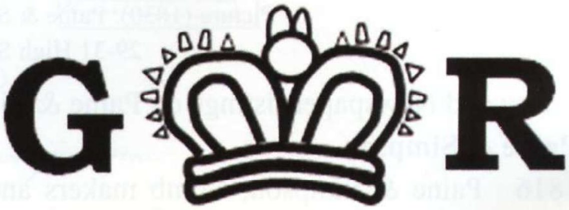
Payne & Simpson Sovereign Rocking Balance



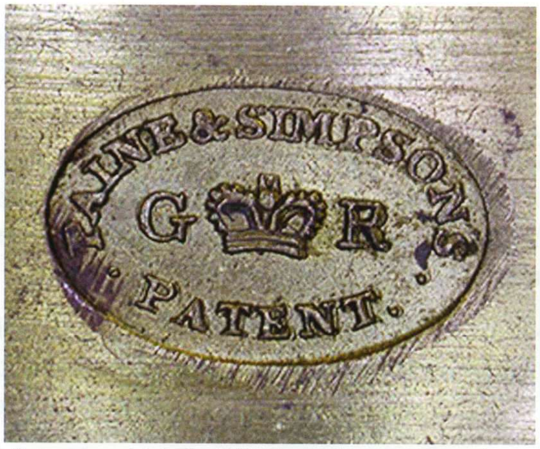
Payne & Simpson Sovereign Rocking Balance Box


Payne & Simpson Sovereign Rocking Balance
Dimensions: Length: 55 mm, Width: 18 mm, Height: 25 mm

Paine and Simpson stamped their brass box with their maker mark a Crown with GR:



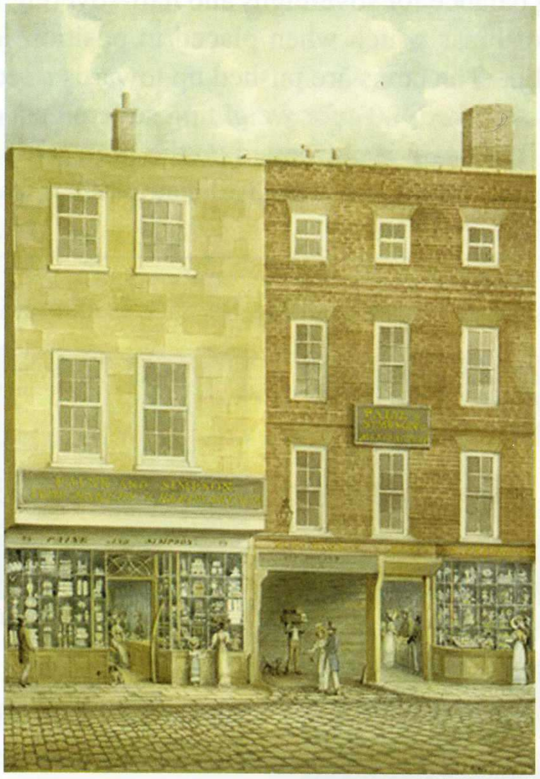
Paine & Simpson maker mark Crown between G and R



Brass Box lid stamped label: 'PAINE & SIMPSON'S / . PATENT. . '
around Crowned GR

From the Crown with G.R. on the box lid this rocker was most likely made during the reign of George IV (1820-30).

Paine & Simpson's shop at 29-31 High St., Borough, London Bridge is illustrated in the 1830 picture below:



Picture (1830): Paine & Simpson, comb makers & hardwaremen,
29-31 High St, Borough, London Bridge

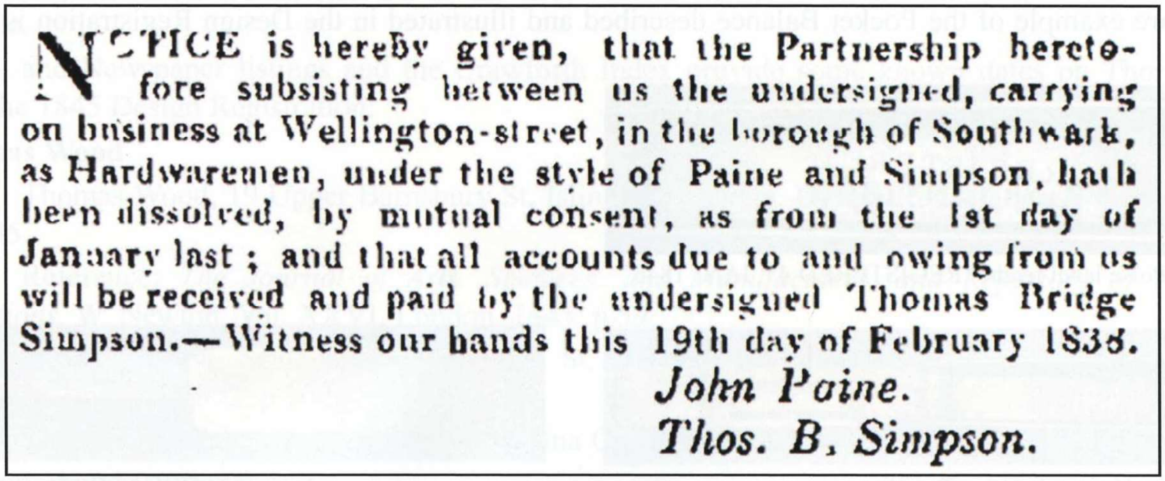
Directory and Newspaper listings on Paine & Simpson:

Paine & Simpson

1816 Paine & Simpson, Comb makers and hardwaremen, 29 High St, Borough, London Bridge, Reference: *Kent's London Directory 1816*.

1827 Paine & Simpson, Comb makers and hardwaremen, 29 High St, Borough, London Bridge, Reference: *Post Office London Directory, 1827.*

1838 *London Gazette*, Tuesday February 20, 1838, p.16. Partnership Dissolved, Paine and Simpson, Wellington St., Southwark, hardwaremen.



NOTICE is hereby given, that the Partnership heretofore subsisting between us the undersigned, carrying on business at Wellington-street, in the borough of Southwark, as Hardwaremen, under the style of Paine and Simpson, hath been dissolved, by mutual consent, as from the 1st day of January last; and that all accounts due to and owing from us will be received and paid by the undersigned Thomas Bridge Simpson.—Witness our hands this 19th day of February 1838.

John Paine.
Thos. B. Simpson.

1839 Paine & Simpson, Comb makers and hardwaremen, 57 High St, Borough, London Bridge, Reference: *Post Office London Directory, 1839*.

1839 Paine & Simpson, Comb manufacturers and hardwaremen, 3 Wellington St, Borough, London Bridge. Reference: *Robson's London & Birmingham Directory - part 1* [London], (1839), p.669.

Follow-on company listings:

Thomas B. Simpson & Co.

1841 Simpson Thomas B. & Co., hardwaremen, wholesale, 156 Leadenhall St., London, Reference: *Post Office London Directory* (1841), p.729.

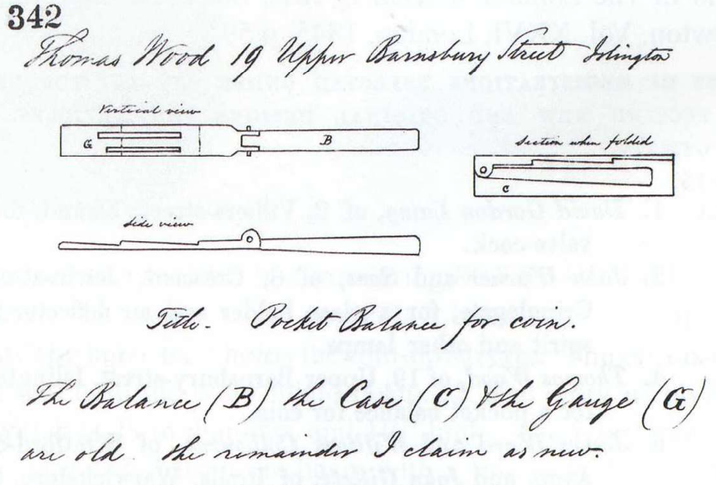
Thomas Simpson Jun. & Co,

1845 Simpson Thomas, Jun. & Co, (Successors to Paine & Simpson), comb & brush manufacturers, hardwaremen & cutlers, dressing case, writing desk & workbox makers, 156 Leadenhall St., London, Reference: *Post Office Directory of London and Birmingham with Warwickshire - Part 1*: London (1845), p.462.

Thomas Wood

A second style of miniature portable Balance for coin found in a brass box was made by Thomas Wood, Commercial traveller, inventor, and scale-maker of 19 Upper Barnsbury St, Islington, London, 1845. Wood submitted a Design Registration for a non-standard folding sovereign balance in a brass case.

The design was originally registered No. 342 by Thomas Wood on Jan. 4, 1845, as a "Pocket Balance for coin":



342

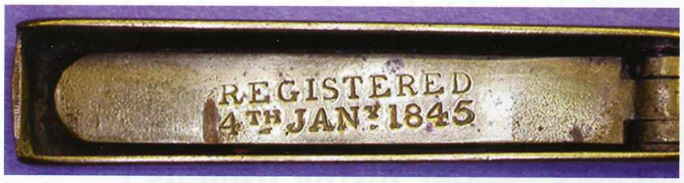
Thomas Wood 19 Upper Barnsbury Street Islington

Title - Pocket Balance for coin.

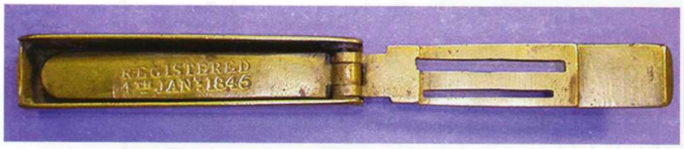
The Balance (B) the Case (C) & the Gauge (G) are old. the remainder I claim as new.

Copy of 1845 Design Registration

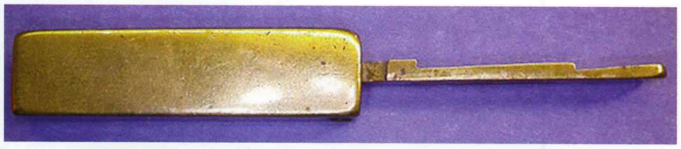
A very rare example of the Pocket Balance described and illustrated in the Design Registration is shown in Variant 1:



Variant 1: Poise label reads: 'REGISTERED 4TH JAN^{Y} 1845'



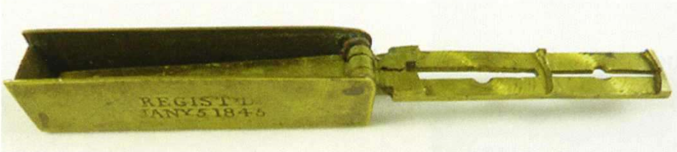
Variant 1: Open Top View



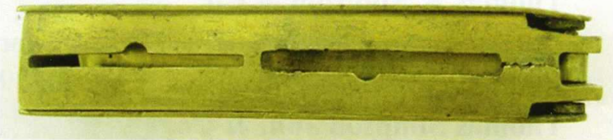
Variant 1: Open Side View

Dimensions: Length (Closed): 51 mm, (Open): 98 mm Width: 10 mm, Height: 13 mm

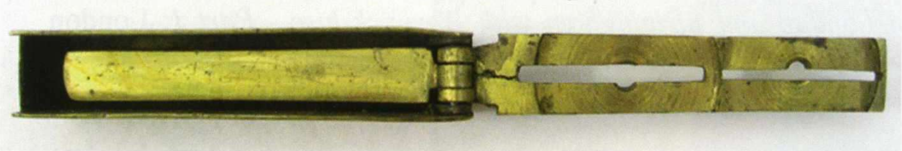
A second version of the Thomas Wood Pocket Balance is shown in Variant 2 with in-line slot gauges in the machine rimmed sovereign and half-sovereign platters. The label on the side of the brass box implies that this design was perhaps registered the next day, Jan. 5, 1845. The machined circular platters with gauge slots are more in keeping with the style of portable rocker being produced in Birmingham in 1845.



Variant 2: Brass box label reads 'REGIST'D JAN^{Y} 5 1845'



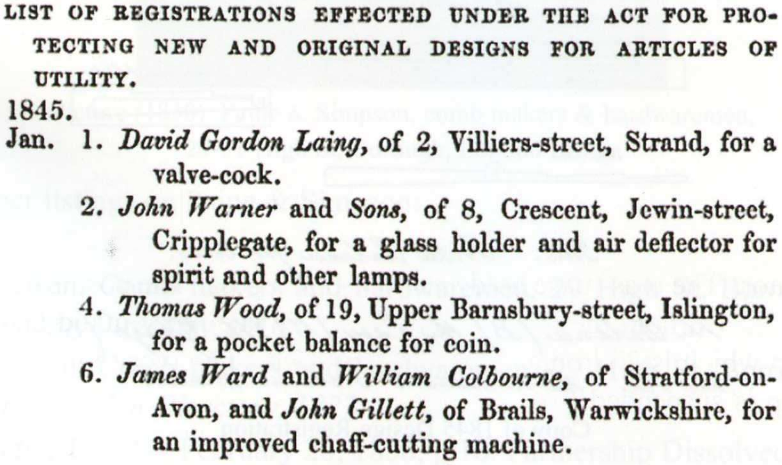
Variant 2: Closed Top View



Variant 2: Open Top View

Dimensions: Length (Closed): 51 mm, (Open): 98 mm Width: 10 mm, Height: 13 mm

There is no record of a 2nd Design Registration by T. Wood on January 5, 1945, according to the Design Registration reports found in The *London Journal of Arts, Sciences, and Manufactures, and Repertory of Patent Inventions*, W. Newton, Vol. XXVI, London, 1845, p.59.



LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.
Jan. 1. *David Gordon Laing*, of 2, Villiers-street, Strand, for a valve-cock.
2. *John Warner* and *Sons*, of 8, Crescent, Jewin-street, Cripplegate, for a glass holder and air deflector for spirit and other lamps.
4. *Thomas Wood*, of 19, Upper Barnsbury-street, Islington, for a pocket balance for coin.
6. *James Ward* and *William Colbourne*, of Stratford-on-Avon, and *John Gillett*, of Brails, Warwickshire, for an improved chaff-cutting machine.

Design Registration Report for Jan. 1 to 6th, 1845

There are only three known examples of the Thomas Wood Pocket Balance for coin. Two are illustrated in this article.

Directory and Newspaper listings and the Crawforth Index provide some known dates on Thomas Wood beyond the 1845 Design Registration:

Thomas Wood

1845 Thomas Wood, 19 Upper Barnsbury St, Islington, London. Design Registration No. 342. Jan. 4, 1845.

Reference: *The Journal of Arts, Sciences, and Manufacuters, and Repertory of Patent Inventions*, W. Newton, Vol. XXVI, London, 1845, p.59.

1852 Thomas Wood, Scale maker, 29 Allen St, Goswell Rd., London, Reference: Post Office Directory, London, 1852, p.1075

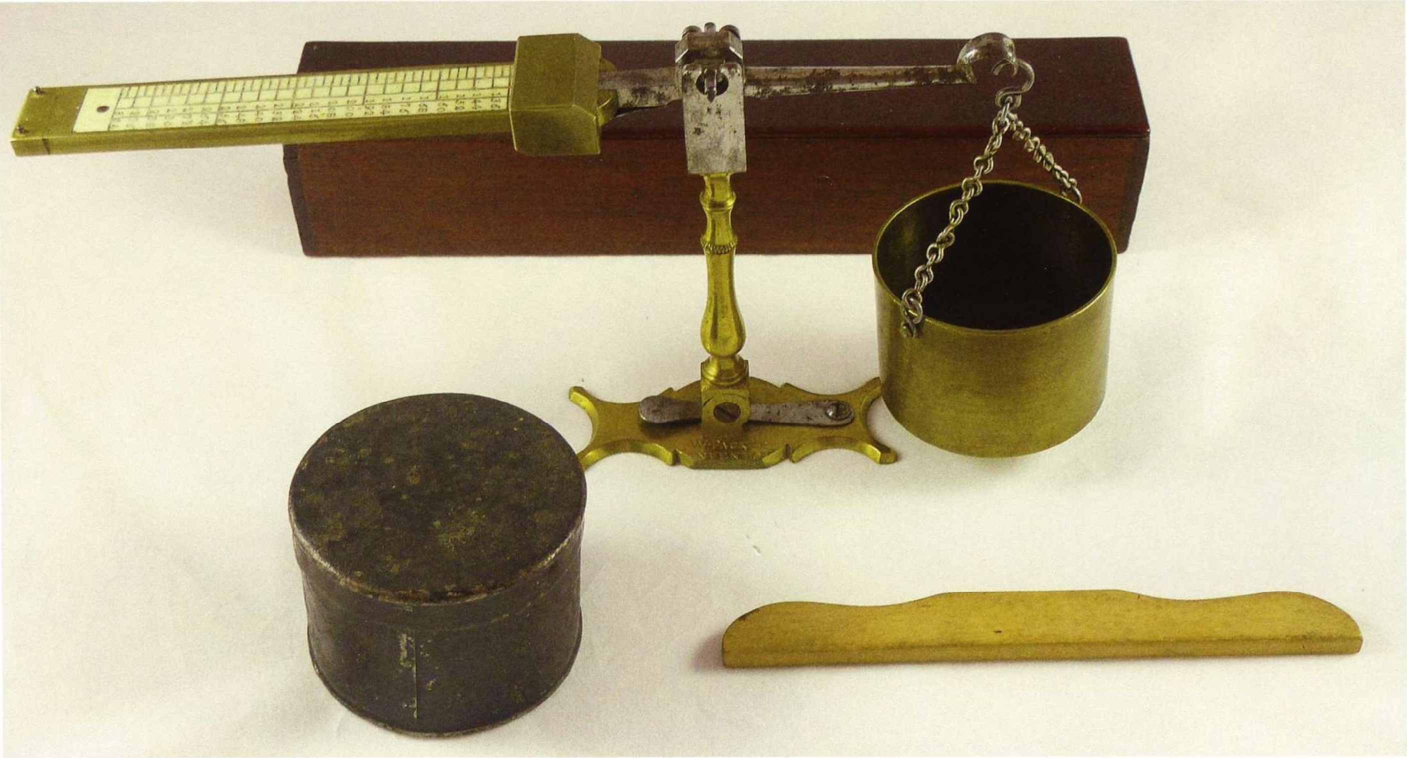
1865 Thomas Wood Deceased. Reference: Diana Crawforth-Hitchins

Thomas Wood (junior?)

1883 Thomas Wood, Scale-beam and machine forger, 23 Shopton St, Hackney Rd, London E., Reference: *Morris Directory of London, 1883.*

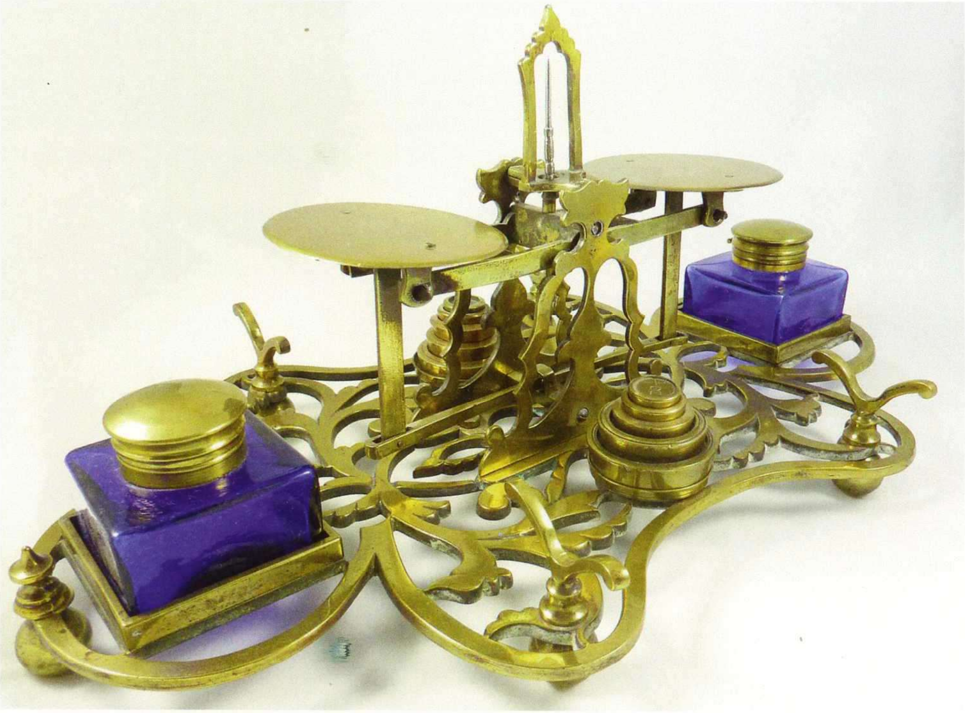
The 1883 reference is most likely the son of Thomas Wood.

Showcase



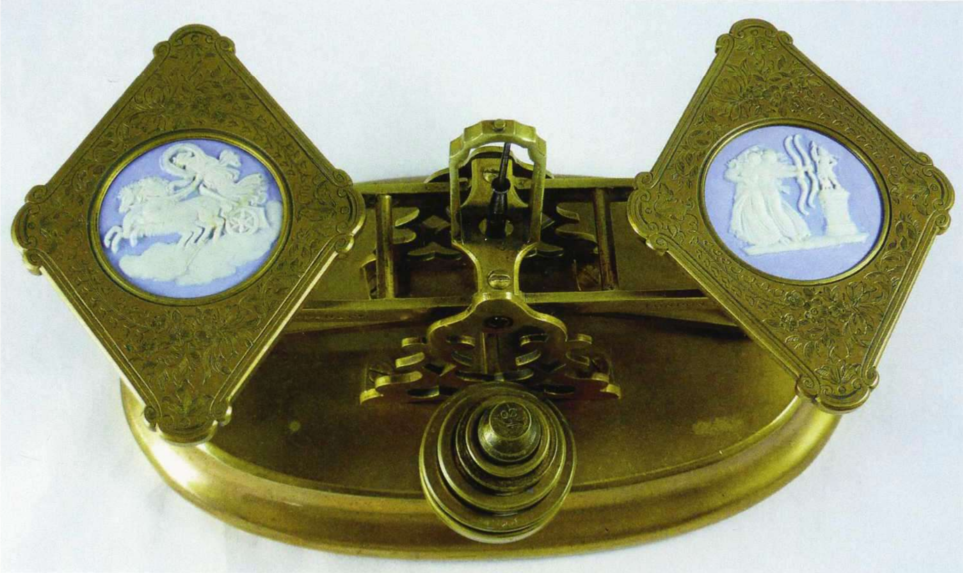
This small seed scale is contained in a wooden box measuring 8³/₈" by 1½" by 1½". The cup is contained in a tin container 2¼" in diameter. The scale is of 3 parts: 1. A brass post 4¹/₈" high on a brass base which is engraved W. Packer Inventor. The brass base holds the fold-down post. The post is held upright with a spring. When in upright position, it will hold the ivory inlaid beam. 2. The ivory inlaid beam is 7⁷/₈" long and ¾" wide. 3. A brass seed cup which is 2" in diameter and 1½" high. The ivory inlay in the beam is numbered 100 to 304. The seed cup is suspended from the beam with a fine jack chain. The scale is believed to be English. A striker is included. Lesley N. Firth Collection

Showcase



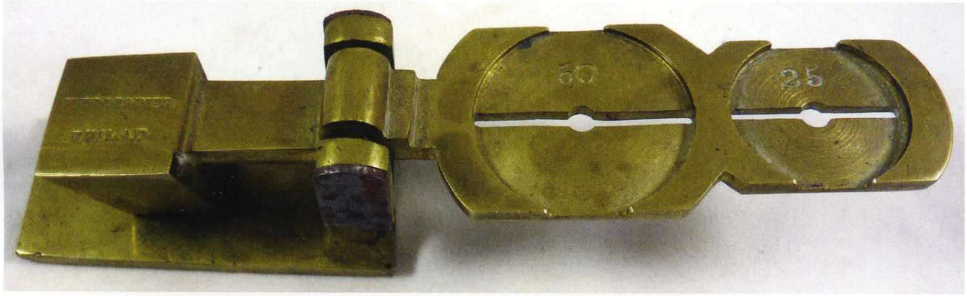
This partners' scale was made by S Mordan & Co, probably about 1880. It is the only example of a partners' scale known. It is made of gilded brass with matching Bristol-blue ink bottles. It was designed to sit in the center of a large desk at which partners sat facing each other. Each partner had a pen rest and a set of weights on his side of the scale as well as a Bristol-blue bottle of ink on his right of the scales. The blue glass contrasts with the gilded brass making a striking centerpiece for the partners' desk. The two sets of weights are identical.

Judy & Eric Soslau Collection



S Mordan & Co, London is engraved on the beam of this postal scale. The scale has an oblong base measuring 6¾" long by 4" wide. It has blue & white circular Wedgwood plaques in the center of highly engraved diamond shaped plates. The simple oval base holds 5 weights marked oz ½, F, 1P, 2P and 4P.

Larry Press Collection



H. Troemner, Philad is marked on the poise of this CCD. It was made circa 1850, but no patent has been found. It measures 5¼" long by 1" wide and is used for determining diameter, weight and thickness of silver U.S. quarters and half-dollar coins.

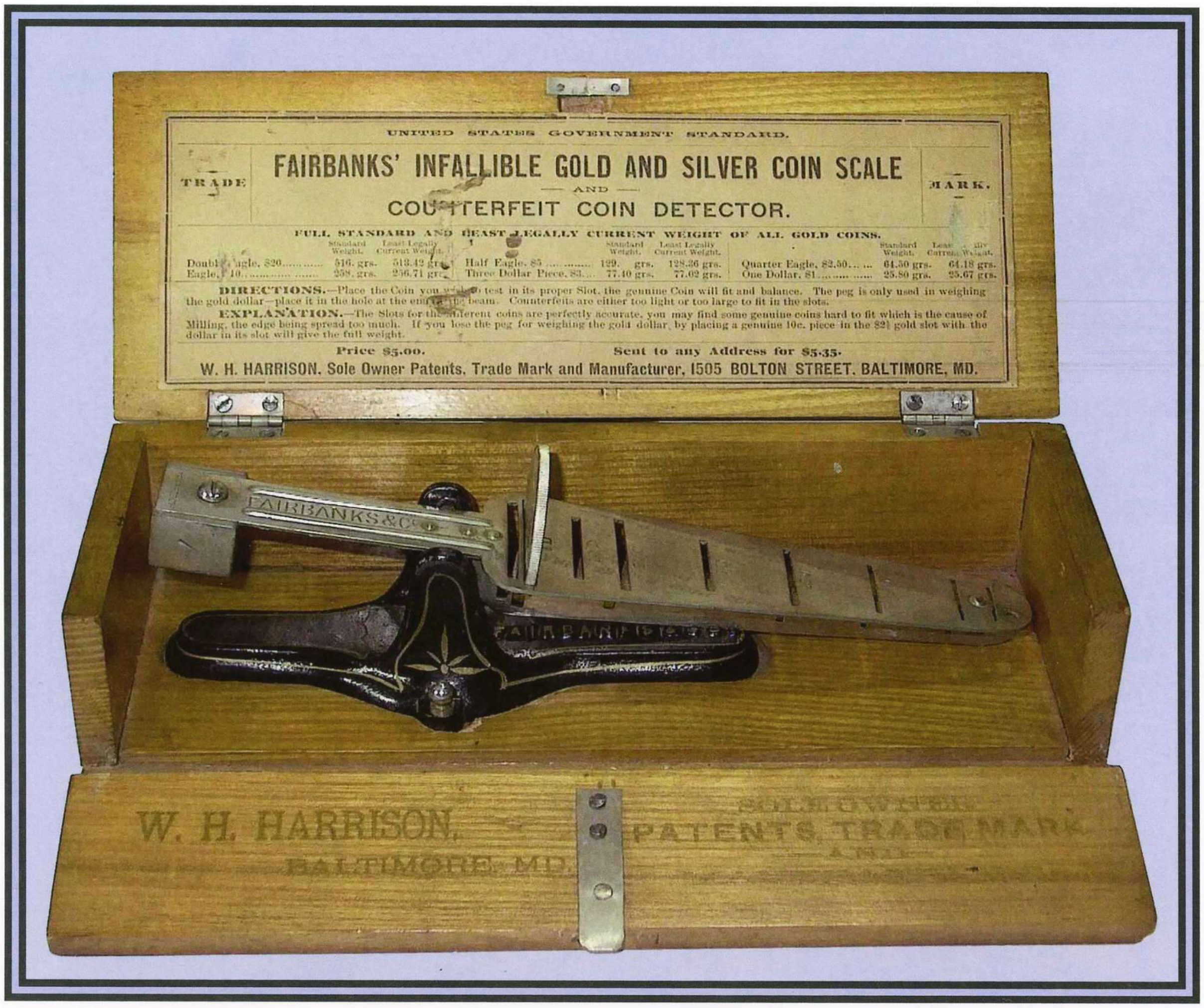
Private Collection

ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2016 ISSUE NO. 2 PAGES 4245 - 4272



UNITED STATES GOVERNMENT STANDARD.

TRADE FAIRBANKS' INFALLIBLE GOLD AND SILVER COIN SCALE — AND — COUNTERFEIT COIN DETECTOR. MARK.

FULL STANDARD AND LEAST LEGALLY CURRENT WEIGHT OF ALL GOLD COINS.

	Standard Weight.	Least Legally Current Weight.
Double Eagle, $20..........	516. grs.	513.42 grs.
Eagle, $10..........	258. grs.	256.71 grs.
Half Eagle, $5..........	129. grs.	128.36 grs.
Three Dollar Piece, $3....	77.40 grs.	77.02 grs.
Quarter Eagle, $2.50......	64.50 grs.	64.18 grs.
One Dollar, $1..........	25.80 grs.	25.67 grs.

DIRECTIONS.—Place the Coin you wish to test in its proper Slot, the genuine Coin will fit and balance. The peg is only used in weighing the gold dollar—place it in the hole at the end of the beam. Counterfeits are either too light or too large to fit in the slots.

EXPLANATION.—The Slots for the different coins are perfectly accurate, you may find some genuine coins hard to fit which is the cause of Milling, the edge being spread too much. If you lose the peg for weighing the gold dollar, by placing a genuine 10c. piece in the $2½ gold slot with the dollar in its slot will give the full weight.

Price $5.00. Sent to any Address for $5.35.

W. H. HARRISON, Sole Owner Patents, Trade Mark and Manufacturer, 1505 BOLTON STREET, BALTIMORE, MD.

Cover Picture

The Fairbanks' Infallible gold and silver coin scale and counterfeit coin detector shown on our cover was manufactured by W.H. Harrison. It is rare to find this counterfeit coin detector complete with an original wooden box and the pin for the $1 gold coin.

The directions read as follows: *Place the coin you wish to test in its proper Slot, the genuine Coin will fit and balance. The peg is only used in weighing the gold dollar-place it in the hole at the end of the beam. Counterfeits are either too light or too large to fit in the slots*...If you lose the peg for weighing the gold dollar, by placing a genuine 10c. piece in the $2½ gold slot with the dollar in its slot will give the full weight.

Berning Collection

Contents

An Overview Covering Italian Coin Scale Boxes
Ludwig Ramacher 4247-4260

The Bochkoltz Substitution Balance, or: Was Mettler First?
Thomas Allgeier 4261-4267

A 19th century Multi-Coin English Balance Maker - John Alker
Michael Foster 4268-4271

Showcase 4272

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

EQUILIBRIUM is published quarterly in February, May, August and November.
© 2016 International Society of Antique Scale Collectors ISSN: 0893-2883

International Society of Antique Scale Collectors
Founded September 1976
Internal Revenue Service 501 (c) (3) EIN 36-2976411
Tel 612.925.1386
www.isasc.org

Officers 2016

President........................ Bob Hayden
Vice Presidents..................... Greg Hill
.... Jerome Katz
.... Greg Moss
.........................Mary Anne Murphy
...........................Shirley Schmidt
Secretary...................... Carol Hayden
Treasurer....................... Kurt Beyreis

For membership information contact
Shirley Schmidt sschmidt@avci.net
5790 N. Lakeshore Rd. Palms, MI 48465

Published with the co-operation and support of
ISASC Europe
Founded October 1993

CHARITY COMMISSIONERS FOR ENGLAND & WALES NO 1037558
www.isasce.com

Trustees and Officers 2014-2016*

Chairman.................... John Knights*
Secretary................. Thomas Allgeier*
Treasurer.................... .Mike Sharpe*
Meeting Secretary............... Peter Elliott
European Representative......... .Jaap Visser
Publications Officer.............. David Apps
Information Officer...... D Crawforth-Hitchins
Trustee...................... Ken Govier*

For membership information contact
John Knights, johnsknights@btinternet.com

Editor: Jan H. Berning, **Tel** 815.895.6328 **Fax** 815.895.6328 JHBerning@comcast.net
Associate Editor: Charley Amsbaugh **Tel** 443.952.7681 research.eggscales@comcast.net
Associate Editor: Diana Crawforth-Hitchins **Tel** 01865.763096 lehitchins@aol.com

Article submissions are preferred in MS Word with Times New Roman Font size 12.
Photos are best in 300 DPI Jpegs in a separate file with a maximum of 3 photos per Email.

An Overview Covering Italian Coin Scale Boxes[1]

BY LUDWIG RAMACHER

There is not much literature in the English or German language covering Italian coin scale boxes[2, 3]. It is time to give an overview of which kind of boxes a collector may find.

Before we come to these types the question may arise: What is Italy? If we go into pre-metric times, we also move to the time before the Italian unification, which came to its conclusion only in 1871. The Italy of today gained and lost territories compared to 1871 (Alto Adige/Trentino; Istria).

Before unification Italy was divided into a multitude of republics, dukedoms, two kingdoms and the Papal States. All these territories will be covered. This leads to a multitude of coins and a multitude of different boxes. Beside coinweights for "Italian" coins there are also ones for the different conquerors (Spain, France, Austria) and such remote countries as Portugal. Rarely we also see those for the British kingdoms or German territories. Thus boxes get rather large, and in addition they often contain coinweights for gold and silver coins.

Most boxes shown are in my own collection, when I do not have examples I use the photos of Guido Zavattoni, who published several books in Italian language about such boxes[4].

The main sites of production have been: Turin (kingdom of Sardinia-Piemont), Genoa (republic), Milano (dukedom), Venice (republic), and Naples (kingdom of the Two Sicilies). Besides that there are a few further sites where production is proven like Bologna (Papal States), most probably Trento and other areas of Northern Italy.

Coinweights of Italian territories have existed for many centuries, surely the first can be dated back to the 14th century. Roman and Byzantine tradition is not even taken into account. Coin scale boxes are a much later phenomenon. None are known from the 17th century, they seem to appear in the 18th century, and soon after we find rules about production and verification.

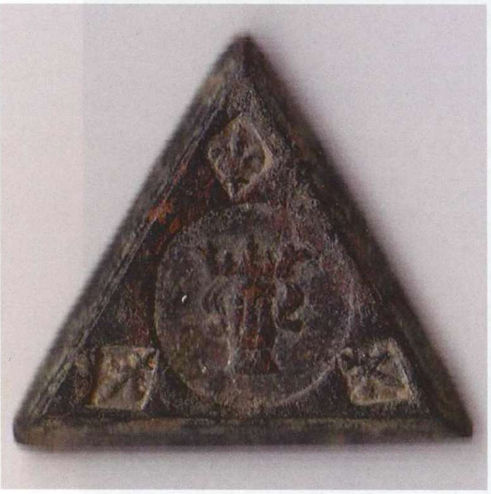


Figure 1. ▲▲ Angevin coinweight (3,55 g), 14th century for the silver carlino.

Very special coinweights did exist in some Italian regions, some especially beautiful ones (e.g. from the Papal States) or as multitudes of coin units (up to 100 fold). Those are shown in such cases.

A. Turin

The kingdom of Sardinia-Piedmont included, beside the actual region of Piedmont, also Savoy (now France) and a part of the French south shore (to Nice), Sardinia and Liguria (after the Congress of Vienna in 1815). Originally a dukedom; it became a kingdom after 1713 by acquiring Sicily, which it was forced to exchange for Sardinia in 1720 (both Sicily and Sardinia were kingdoms).

Guido Zavattoni thinks coinweights have definitively been in use since the 16th century, possibly earlier. Boxes came much later, most probably after legislative reforms 1749/50, which organized the profession of scale-makers[5] and described technical requirements in detail. The royal decree dated 21 February 1755, provided that new coins have to be checked with coinweights while old coins should be checked by the "denari" and "grani"-weights which also had to be in the boxes[6].

Boxes from Piedmont have been typically made with numerous coinweights, which were described with the name of the coin and its mass and value on the label. The printing of the labels took place at the royal printing office (stamperia reale) renamed (stamperia nazionale) during the Napoleonic occupation. Figure 5 proves that private printers were also authorized to print such labels later in the 19th century. Several makers are known by name, more will be identified in the future, as it was obligatory to use a personal mark. The verification system for coinweights was different from the system of trade weights[7].

Those boxes known to us provide for 10 to 60 weights (denari weights counted). Originally the boxes were either rectangular or had drawers to keep the weights. The combination of the form of coinweights, the verification marks and type of inscription allow for easy identification of boxes from Piedmont. The later snap lock of the boxes is also a very unique feature not found in other regions.

I am going to describe two boxes as examples. The first case is a box which can be dated to 1781, or slightly earlier due to the fact that the scale is marked "81" and the coins described on the label are from before that year. This is one of the oldest boxes we know. The box is rectangular (300x140mm) with rounded ends. Of the 33 places for coinweights 22 are filled, partly with coinweights for later coins (after 1805). Different from later boxes this one includes five picture-weights (for the "Louis aux deux L" and the silvercoins "Philippo" (Milano), "Scudo d'argento" (here called Crossazzo) Genoa, the "Franceschina" of Tuskany and the "Ecu aux tres palmes" from France). The picture weights are quite similar to those of Lyon, but do not show any verification marks of that city[8], the mass units engraved are those of Piedmont. Beside these five pieces, two more should be of the original composition, among them the piece with the inscription D.N.S D37.13.6 made for the extremely rare "Carlino da 5 Doppie" a gold coin of not less than 48,08 g.

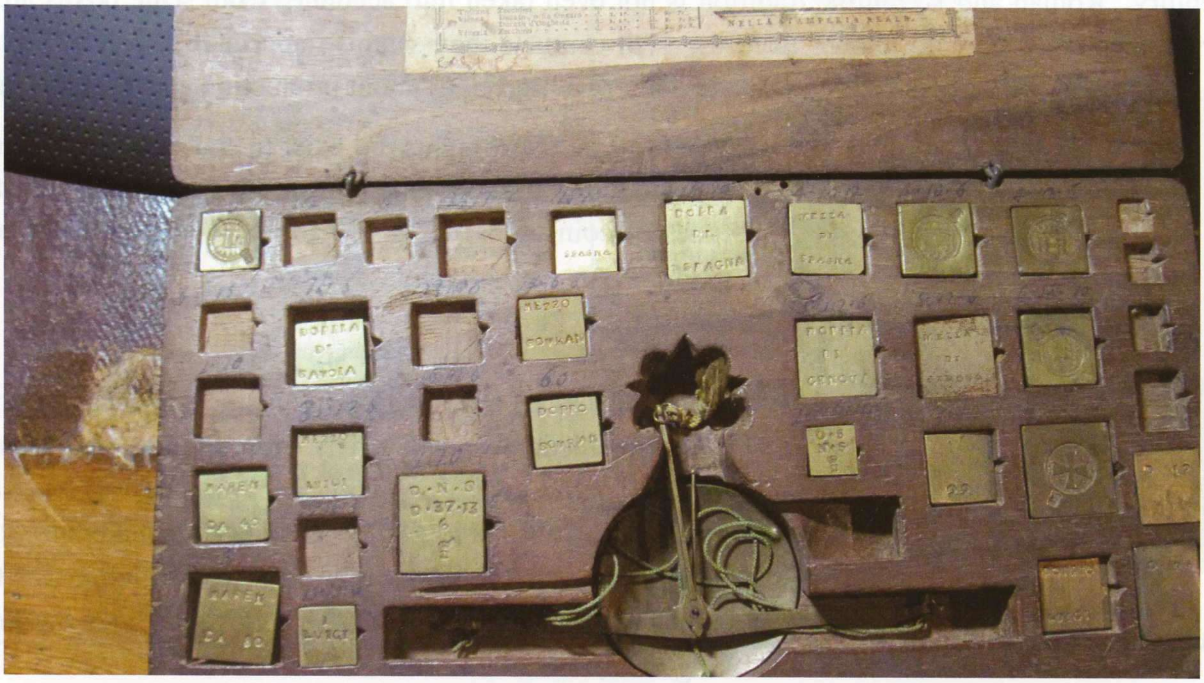


Figure 2. AA Internal view of a box from Turin dated 1781.

The box described now is probably made in the early 19th century and shows clearly different features. The cutout for the scale has moved from front to back, the rectangle has received a nose, the ends are partly cut. This is the way in which Piedmont boxes are usually offered in auctions.

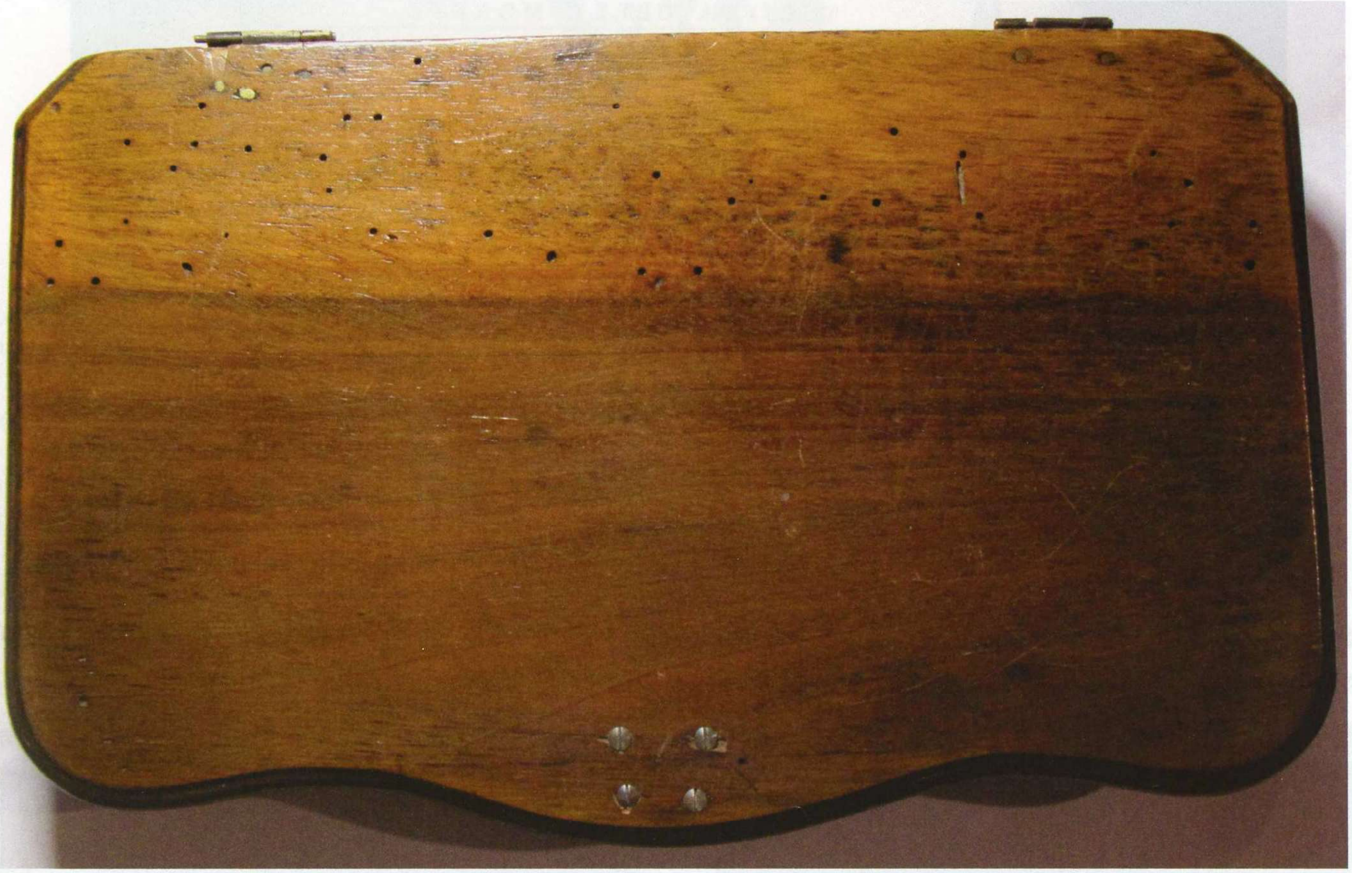


Figure 3. ⩓⩓ The typical shape of many Piedmont boxes.

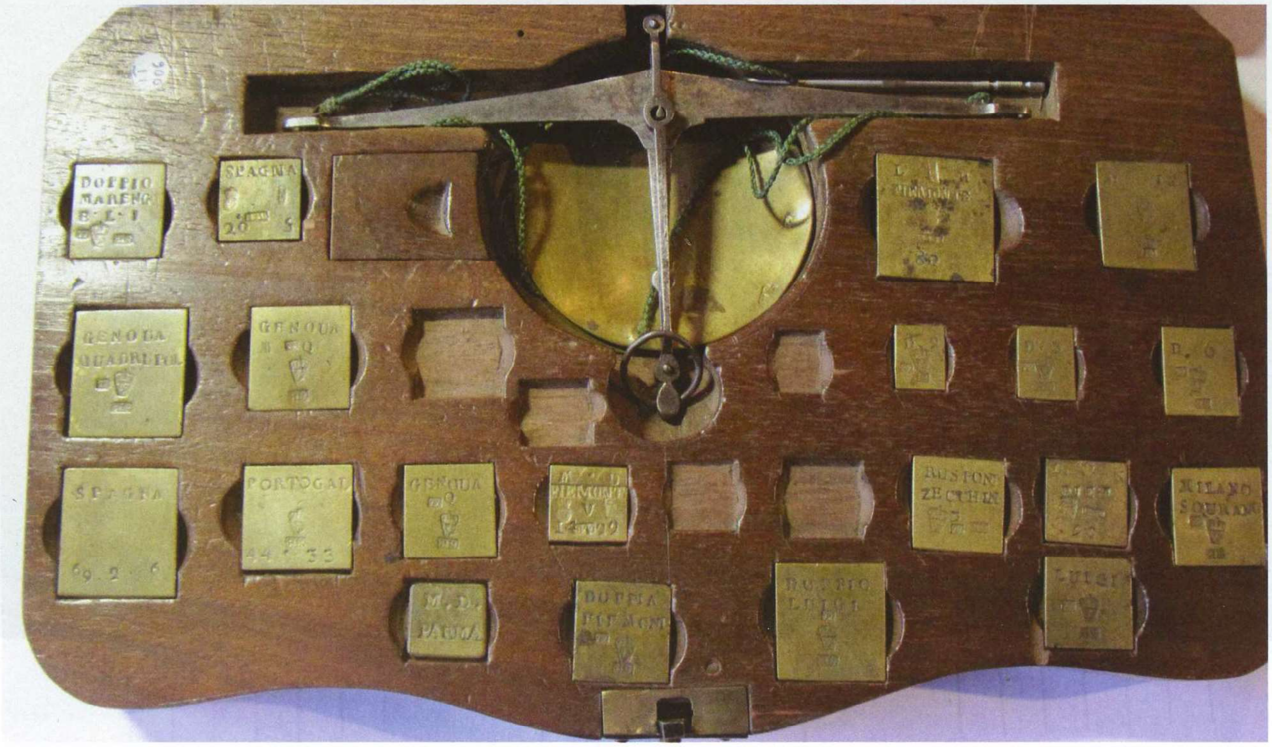
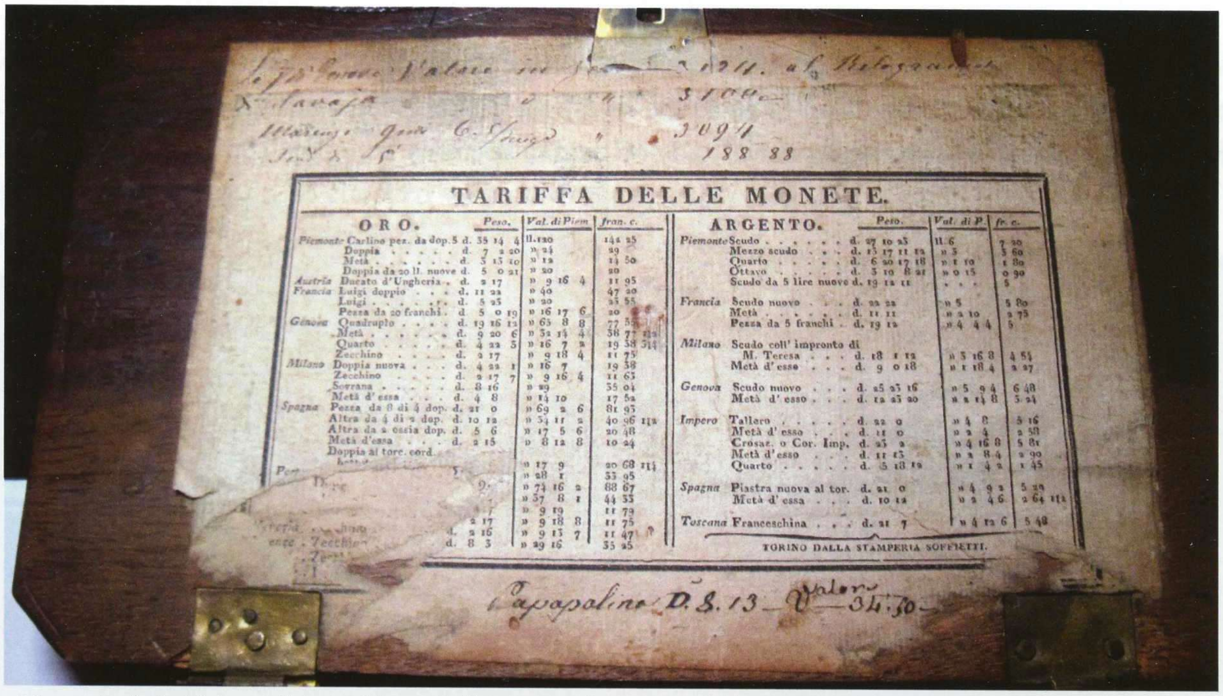


Figure 4. ⩓⩓ Internal view of the box.



[illegible] Valore in [illegible] 1811. al [illegible]
[illegible] 3100
[illegible] 3094
188 88

TARIFFA DELLE MONETE.

	ORO.	Peso.	Val. di Piem	fran. c.
Piemonte	Carlino pez. da dop. 5	d. 35 14 4	ll. 120	142 25
	Doppia	d. 7 2 20	» 24	29
	Metà	d. 3 13 10	» 12	14 50
	Doppia da 20 ll. nuove	d. 5 0 21	» 20	20
Austria	Ducato d'Ungheria	d. 2 17	» 9 16 4	11 95
Francia	Luigi doppio	d. 11 22	» 40	47 20
	Luigi	d. 5 23	» 20	23 55
	Pezza da 20 franchi	d. 5 0 19	» 16 17 6	20
Genova	Quadruplo	d. 19 16 12	» 65 8 8	77 55
	Metà	d. 9 20 6	» 32 14 4	38 77 ½
	Quarto	d. 4 22 5	» 16 7 2	19 38 ¾
	Zecchino	d. 2 17	» 9 18 4	11 75
Milano	Doppia nuova	d. 4 22 1	» 16 7	19 38
	Zecchino	d. 2 17 7	» 9 16 4	11 63
	Sovrana	d. 8 16	» 29	35 04
	Metà d'essa	d. 4 8	» 14 10	17 52
Spagna	Pezza da 8 di 4 dop.	d. 21 0	» 69 2 6	81 93
	Altra da 4 di 2 dop.	d. 10 12	» 34 11 2	40 96 ½
	Altra da 2 ossia dop.	d. 5 6	» 17 5 6	20 48
	Metà d'essa	d. 2 15	» 8 12 8	10 24
	Doppia al torc. cord.	[illegible]	» 17 9	20 68 ¼
Por[illegible]	[illegible]	[illegible]	» 28 1	33 95
	Dop[illegible]	[illegible]	» 74 16 2	88 67
	[illegible]	[illegible]	» 37 8 1	44 33
	[illegible]	[illegible]	» 9 19	11 79
	[illegible]	2 17	» 9 18 8	11 75
[illegible]	Zecchino	d. 2 16	» 9 13 7	11 47
[illegible]	Zecchino	d. 8 3	» 29 16	35 25

	ARGENTO.	Peso.	Val. di P.	fr. c.
Piemonte	Scudo	d. 27 10 23	ll. 6	7 20
	Mezzo scudo	d. 13 17 11 12	» 3	3 60
	Quarto	d. 6 20 17 18	» 1 10	1 80
	Ottavo	d. 3 10 8 21	» 0 15	0 90
	Scudo da 5 lire nuove	d. 19 12 11	. . .	5
Francia	Scudo nuovo	d. 22 22	» 5	5 80
	Metà	d. 11 11	» 2 10	2 75
	Pezza da 5 franchi	d. 19 12	» 4 4 4	5
Milano	Scudo coll' impronto di M. Teresa	d. 18 1 12	» 3 16 8	4 54
	Metà d'esso	d. 9 0 18	» 1 18 4	2 27
Genova	Scudo nuovo	d. 25 23 16	» 5 9 4	6 48
	Metà d'esso	d. 12 23 20	» 2 14 8	3 24
Impero	Tallero	d. 22 0	» 4 8	5 16
	Metà d'esso	d. 11 0	» 2 4	2 58
	Crosaz. o Cor. Imp.	d. 23 2	» 4 16 8	5 81
	Metà d'esso	d. 11 13	» 2 8 4	2 90
	Quarto	d. 5 18 12	» 1 4 2	1 45
Spagna	Piastra nuova al tor.	d. 21 0	» 4 9 2	5 29
	Metà d'essa	d. 10 12	» 2 4 6	2 64 ½
Toscana	Franceschina	d. 21 7	» 4 12 6	5 48

TORINO DALLA STAMPERIA SOFFIETTI.

Papapolino D. S. 13 — Valore 34.30

Figure 5. ⩓⩓ Values of the gold – and silver-coins in mass and Piemont and French money. Three different labels are glued one above the other.

The weights are quadratic reversed truncated pyramids, of which the lower edges are obliquely cut. The obverse shows the name of the coin, the reverse typically the mass in denari, grani and granottini[9].

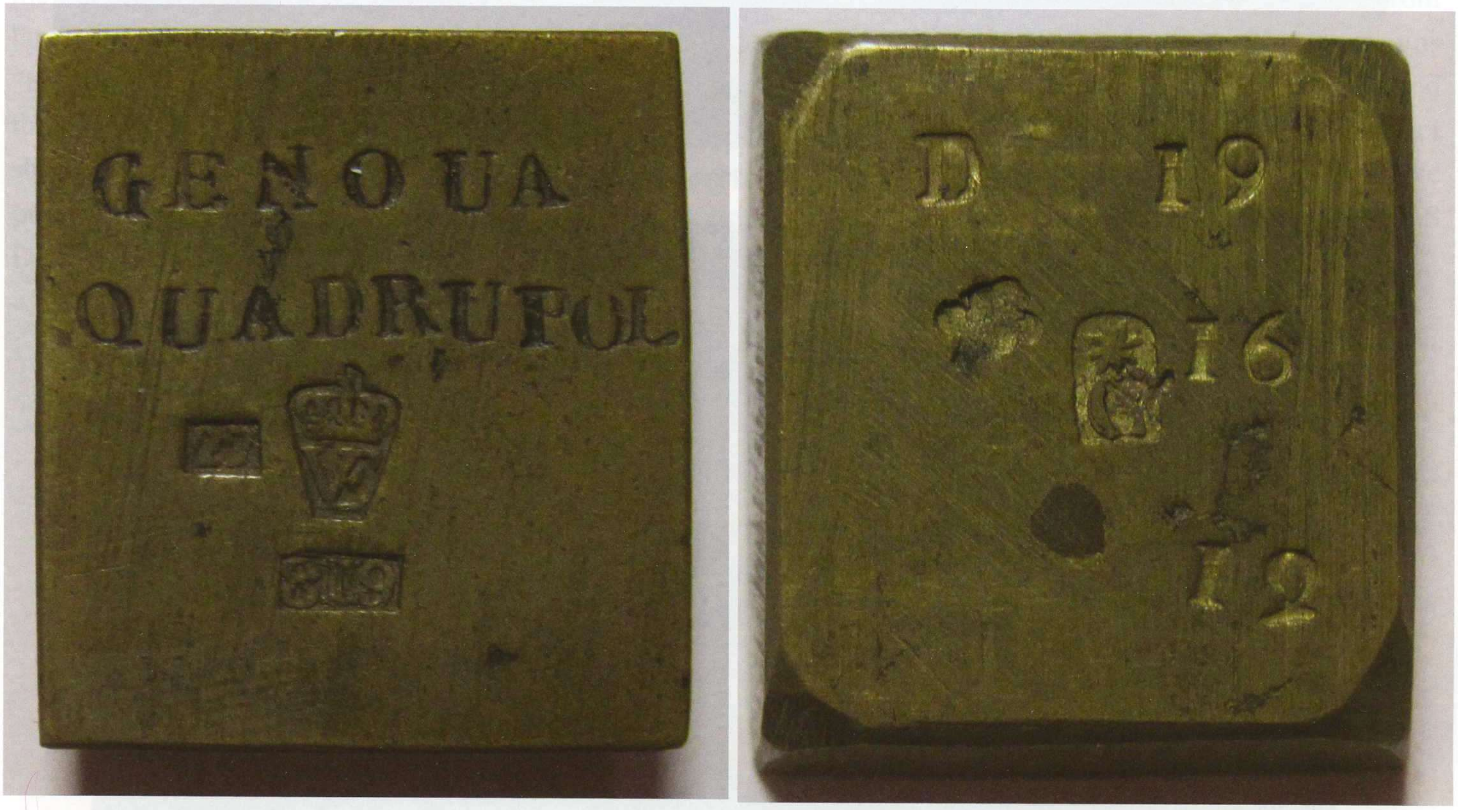


Figure 6. ⩓⩓ Coinweight with annual verification stamps (1819, 1827) made for 96 Lire of Genoa, reverse with makers mark (star/G) and mass.

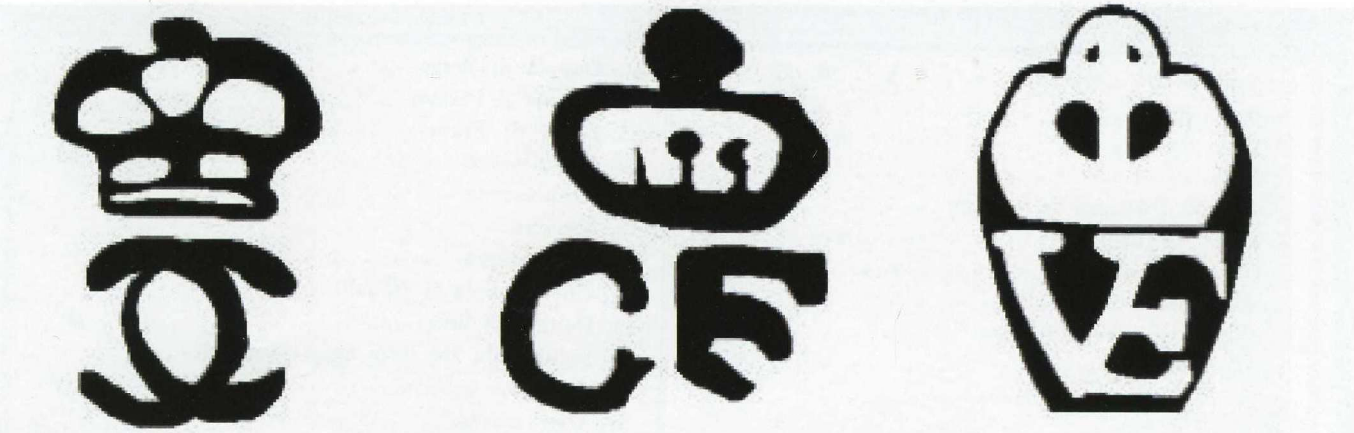


Figure 7. ▲▲ Verification marks for coinweights under Carlo Emmanuel III, Carlo Emmanuel III (for Sardinia) and Vittorio Emmanuele I.

B. Genoa

Disregarding certain possessions overseas, the area of the Republic of Genoa is that of the actual Italian region of Liguria. After 1815 Genoa became part of the kingdom of Piedmont.

Guido Zavattoni assumes that the boxes from Genoa were developed from boxes of Lyon[10]. Indeed there are common features, like the use of a lift pin (in its own holder) in the older boxes, used to take the coinweights out, not very common in any other Italian region.

Genoese Boxes can be proven for sure from 1750 till 1815. Later Genoese boxes cannot be excluded[11]. The boxes are rectangular and cut from solid wood. The known boxes typically have between 28 and 38 places for coinweights typically for gold and silver coins.

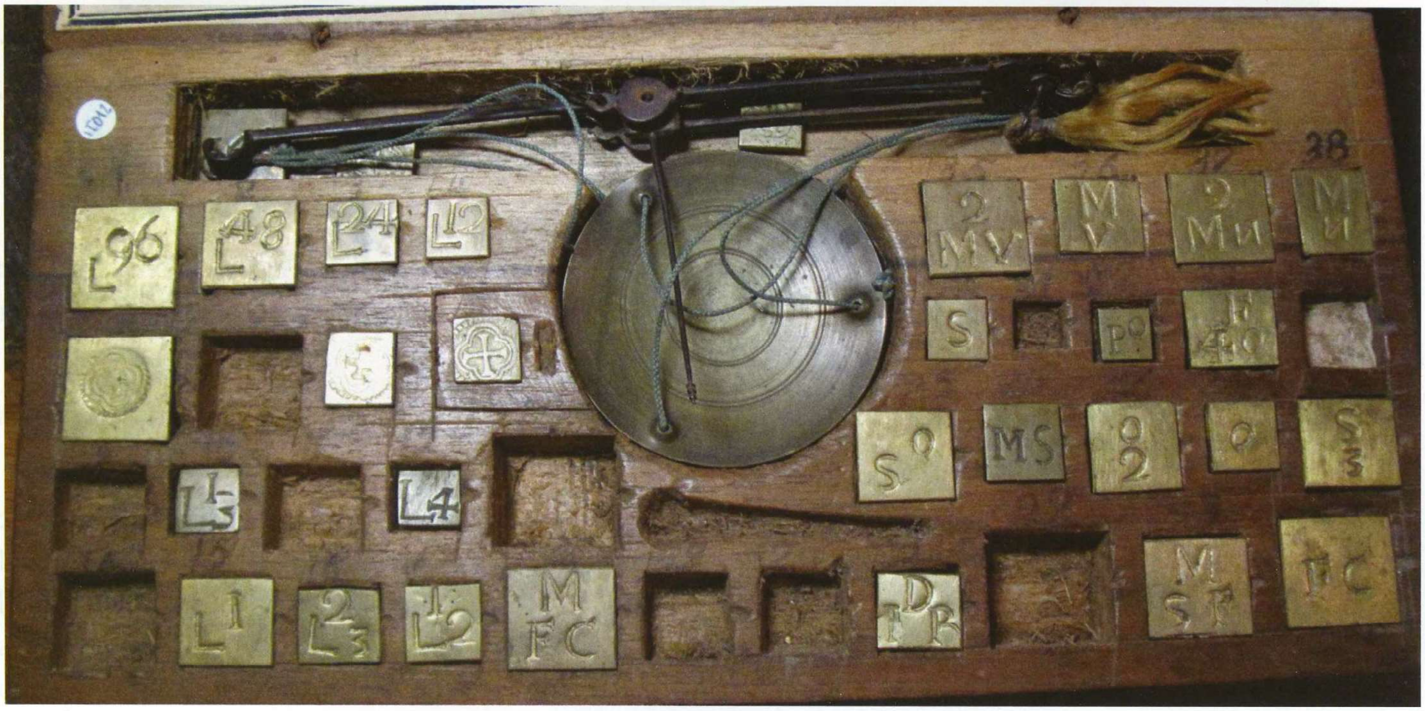


Figure 8. ▲▲ View from top to a typical Genoese box.

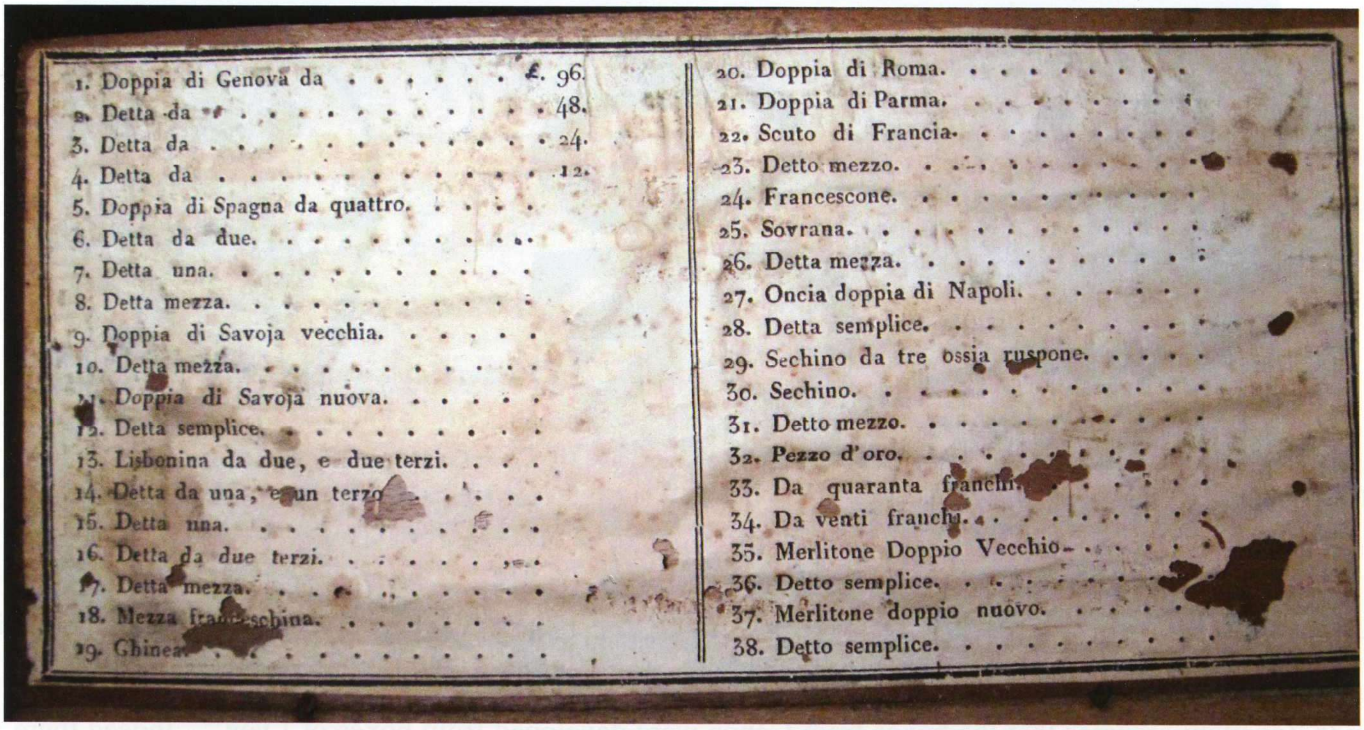

1. Doppia di Genova da £. 96.
2. Detta da 48.
3. Detta da 24.
4. Detta da 12.
5. Doppia di Spagna da quattro.
6. Detta da due.
7. Detta una.
8. Detta mezza.
9. Doppia di Savoja vecchia.
10. Detta mezza.
11. Doppia di Savoja nuova.
12. Detta semplice.
13. Lisbonina da due, e due terzi.
14. Detta da una, e un terzo.
15. Detta una.
16. Detta da due terzi.
17. Detta mezza.
18. Mezza franceschina.
19. Ghinea.
20. Doppia di Roma.
21. Doppia di Parma.
22. Scuto di Francia.
23. Detto mezzo.
24. Francescone.
25. Sovrana.
26. Detta mezza.
27. Oncia doppia di Napoli.
28. Detta semplice.
29. Sechino da tre ossia ruspone.
30. Sechino.
31. Detto mezzo.
32. Pezzo d'oro.
33. Da quaranta franchi.
34. Da venti franchi.
35. Merlitone Doppio Vecchio.
36. Detto semplice.
37. Merlitone doppio nuovo.
38. Detto semplice.

Figure 9. ▲▲ The label of the typical Genoese box shown in Figure 8 above.

In Genoese boxes the places for coinweights are numbered and the label shows the corresponding coin name. The weights are reversed truncated pyramids. The inscription on the weights are mainly a few letters (SO: Sovrana; MS: Mezza Sovrana; FC: Francescone). The picture weights for the Spanish "Doppie" are different and in older boxes for the Genoese Doppie before 1791 with 100/50/25/12,5 Lire. After 1791, (96/48/24/12 Lire) typically combinations of letters and numbers were used (L96 for 96 Lire etc.).

Makers marks are unknown, verification marks in the form of annual stamps can be found occasionally (55, 63 for 1755 and 1763).

C. Milan

Coinweights were in use in Milan and other Lombardic towns from the 14th century. Decrees exist from the 15th century onwards, which prescribed the verification of coinweights. Numbers with four digits on older coinweights refer to the year of the decree such as 1652, 1682, 1698 and 1755.

The first boxes known from the beginning of the 18th century are made from wood, with one or two drawers into which the balance and the coinweights were placed in loose form.

After the reform of coinage under Maria Theresia[12] in 1778, the construction of the boxes changed. The basic construction is of wood, externally covered by very thin black leather (partly decorated), while the internal part is covered by deer leather or chamois. The places for the round, monetiform coinweights are cone-shaped often quite deep. Up to five pieces could be stored above each other (e.g. for Spanish coins). Thus if a box is offered with eight coinweights in those eight places, it is for sure quite incomplete. Up to 43 coinweights in 19 places can be found.

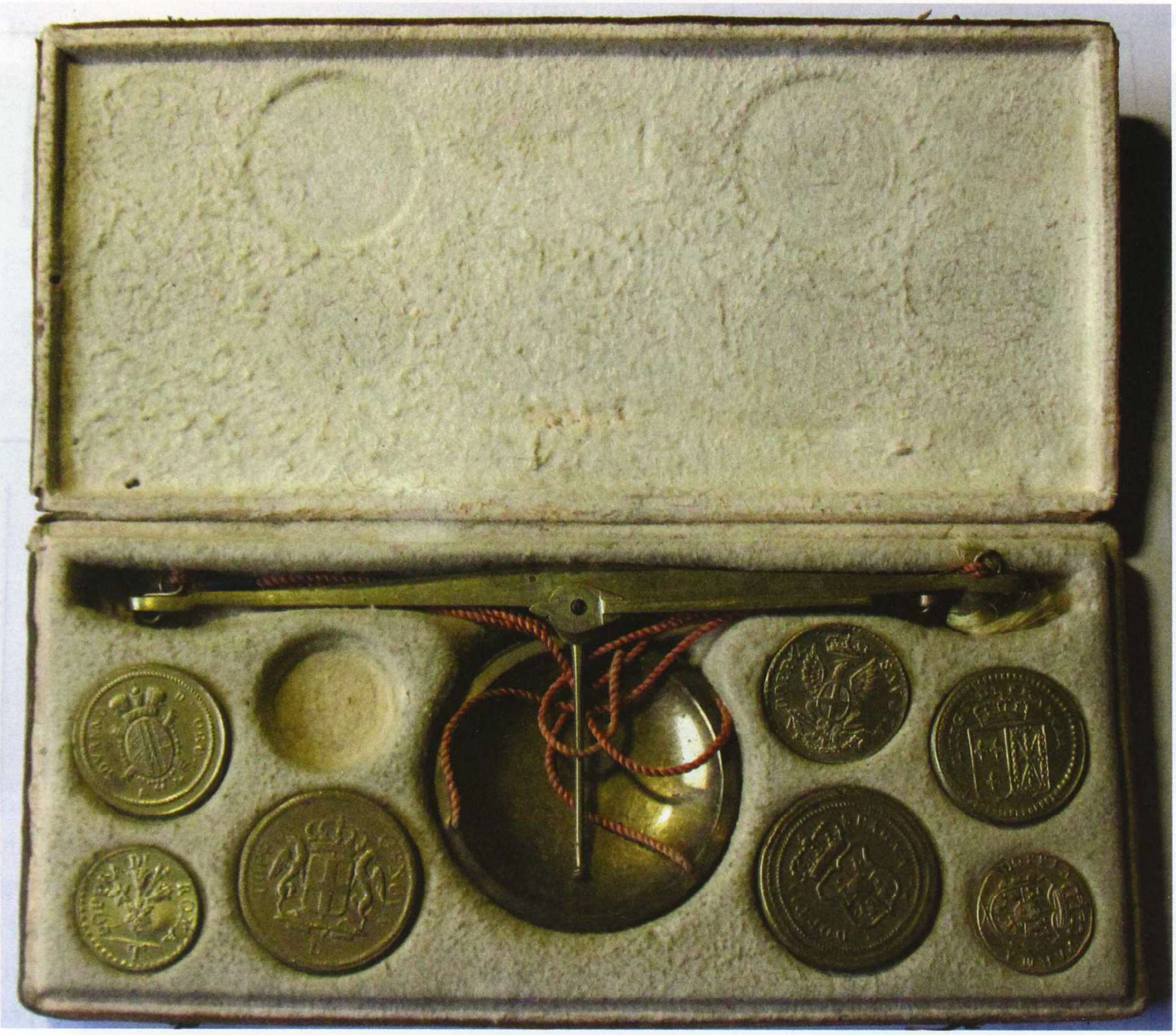


Figure 10. △△ Typical later box from Milan with 18 coinweights in seven used places.

D. Venice

Coinweights from Venice probably got their form in the second half of the 17th century. This type of truncated pyramid with cut corners (so eight sided), was not practical for use in "normal" boxes[13]. Certain types were also known in the form of a truncated cone.

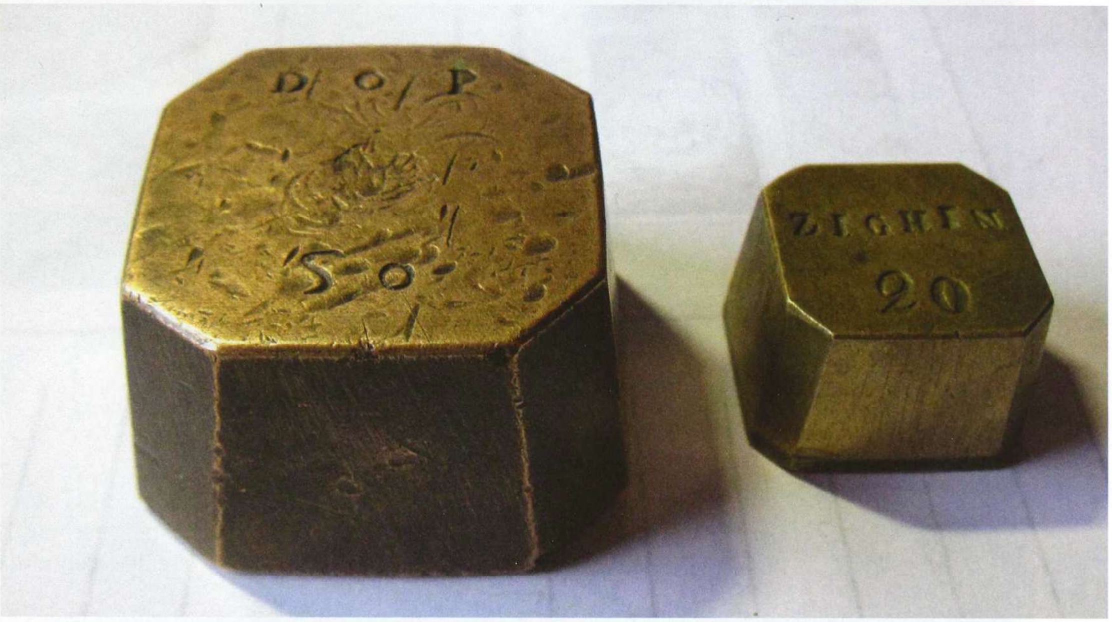


Figure 11. △△ Coinweights for 50 Doppie (=Scudo d'oro) and 20 Zecchini.

Therefore, an open form of box as shown below was developed.

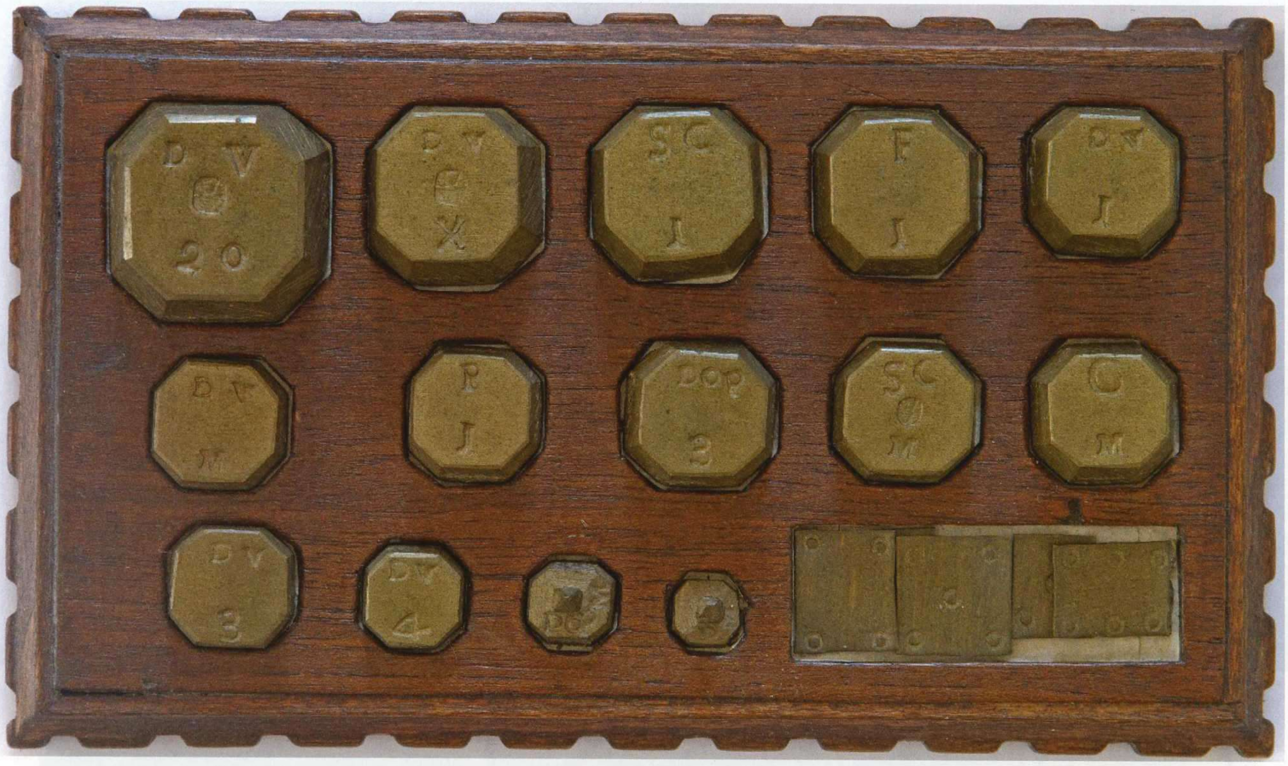
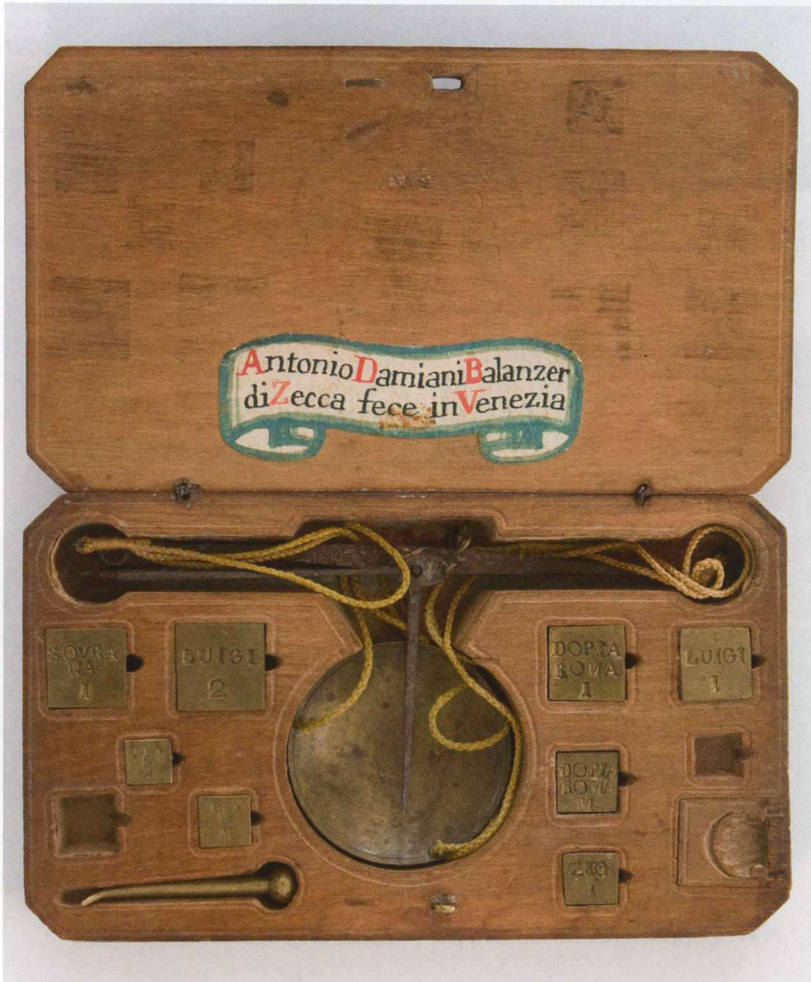


Figure 12. ▲▲ Venetian coinweights in open box.



In 1797 Napoleon conquered the Venetian Republic and the specific production of boxes was stopped. After 1815 Venice became a part of the kingdom of Lombardo-Veneto ruled by the Austrians.

Figure 13. ◀◀ Another completely different type, but clearly made in Venice by the scalemaker of the mint.

E. The Papal States

Coin scale boxes from the States of the Church are virtually unknown. No box has been described from Rome, and just one box for Bologna[14], which most probably was made in the last quarter of the 18th century. However, very beautifully made coinweights are known from Rome, therefore here are two examples.

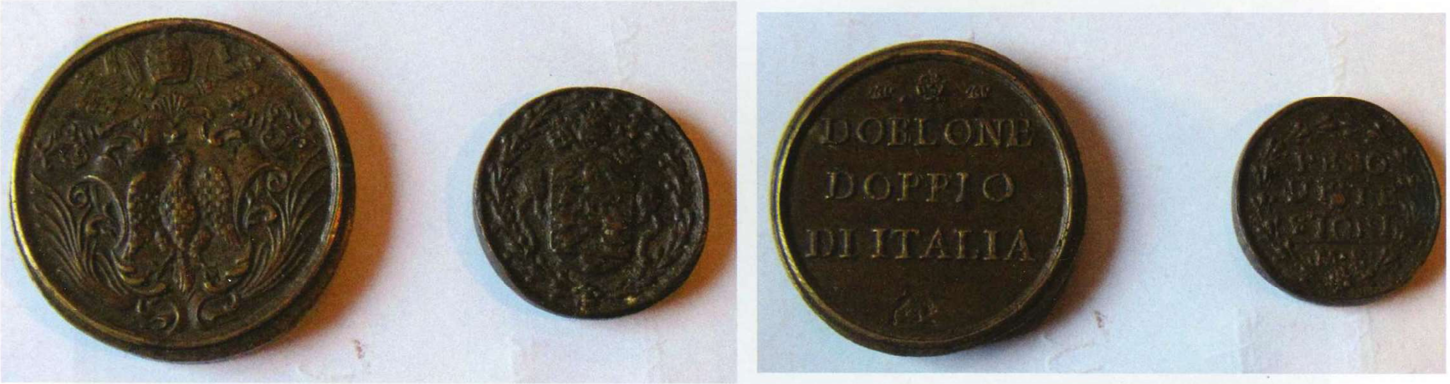


Figure 14. ▲▲ Coinweights for 8 Scudi d'Oro (26,40 g; 1721/24; Innozenz XIII) and Testone (9,02 g; 1676/89; Innozenz XI).

F. Naples

Compared to the Northern Italian territories the coin scale boxes known for the Kingdom of the Two Sicilies are rather simple. Mostly they hold only coinweights for local coins. The specimen in figure 15 contains coinweights for four local silver coins (60 and 120 grana d'argento (before 1784) and 60 and 120 grana d'argento after 1784[15]) and should contain coinweights for four gold coins (4 and 2 Ducati, Doppia Oncia and Oncia).

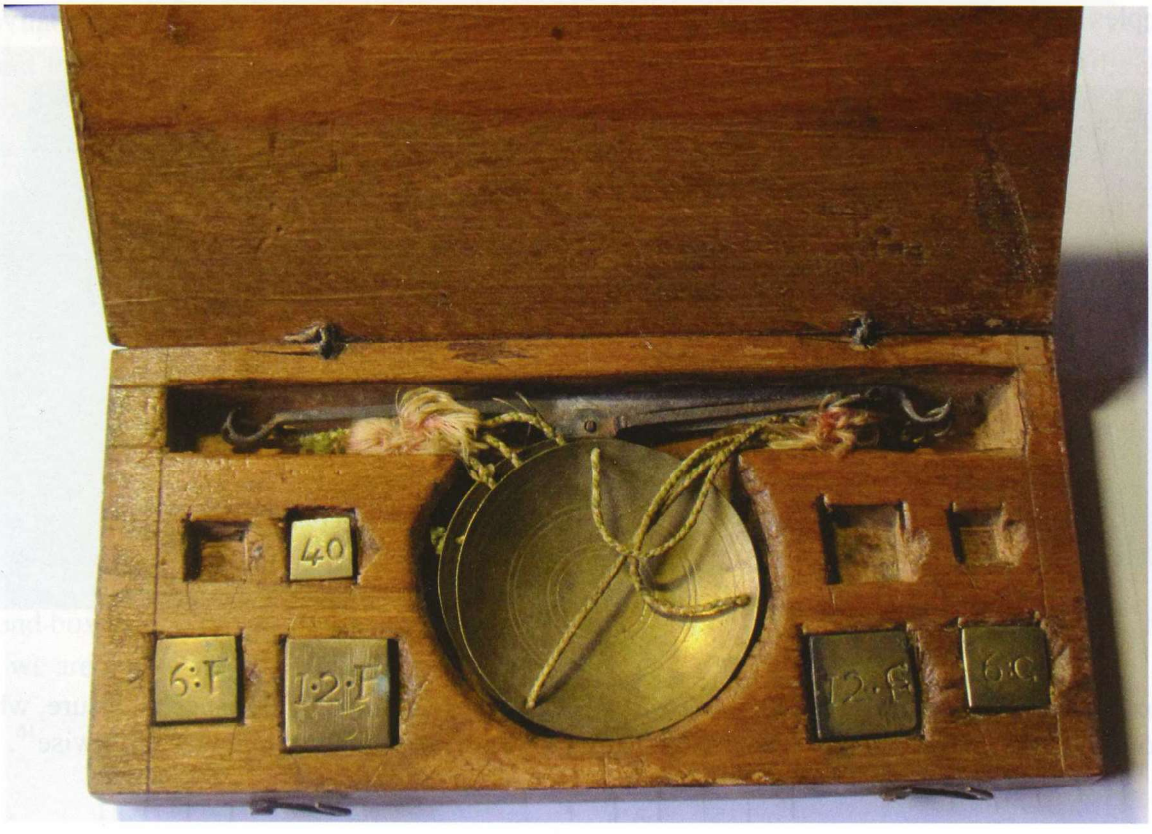


Figure 15. ▲▲ box from Naples after 1784

While the boxes are relatively simple, we know of well manufactured coinweights of Naples from the beginning of the 17th century.

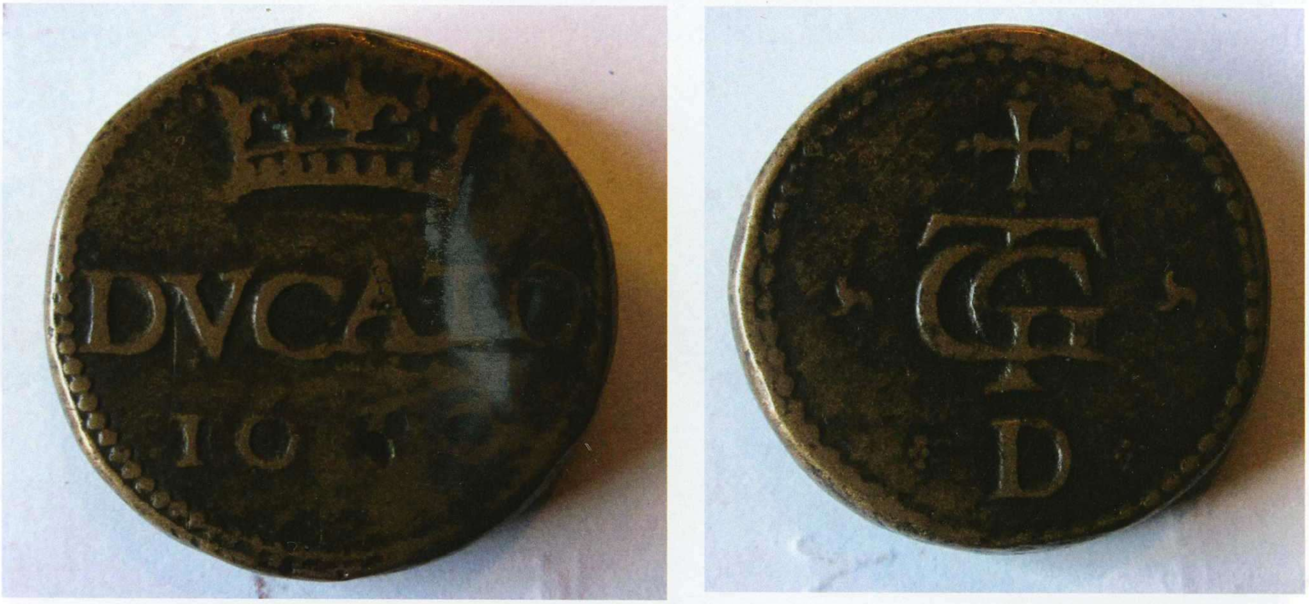


Figure 16. ⩓⩓ Example of a coinweight (28,77 g, Ducato di Napoli) of Giovanni Troiano Gatta (1610)

G. Rest of Northern Italy

What is remaining after all these regions? We know about boxes where we are sure that they have to be Italian, definitively not from the South or the Papal States, but where we still have questions about their origin. Three examples will be shown.

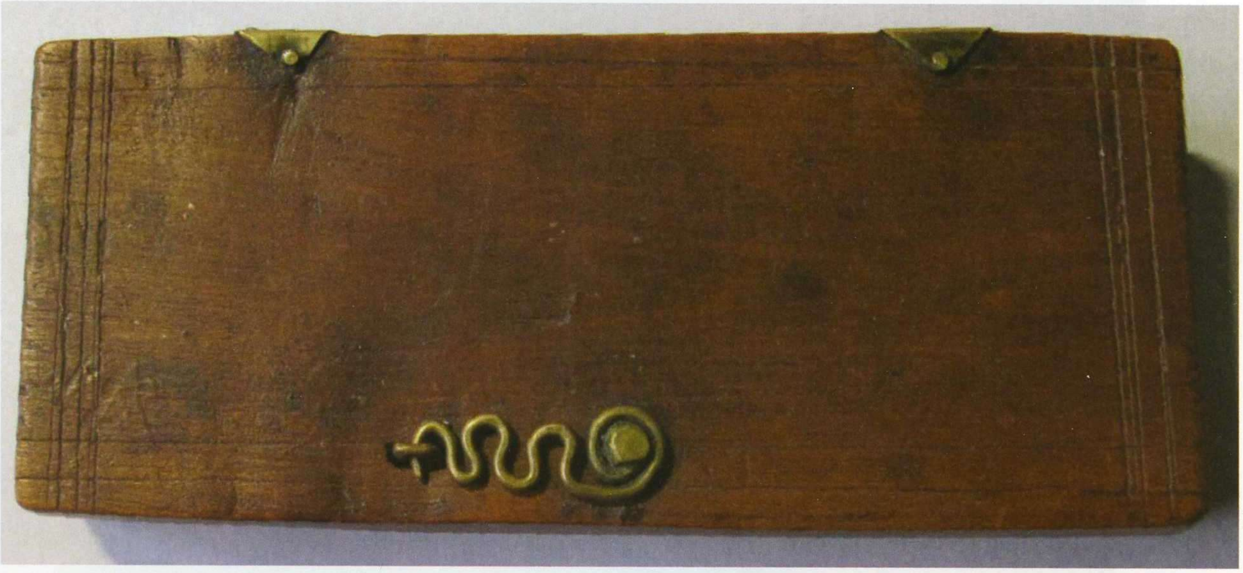


Figure 17. ⩓⩓

The first box (Figure 17) seems to give a hint of Milan: why should somebody use such a closure, which reminds one of the snake in the Milanese shield, which has no understandable advantages otherwise[16].

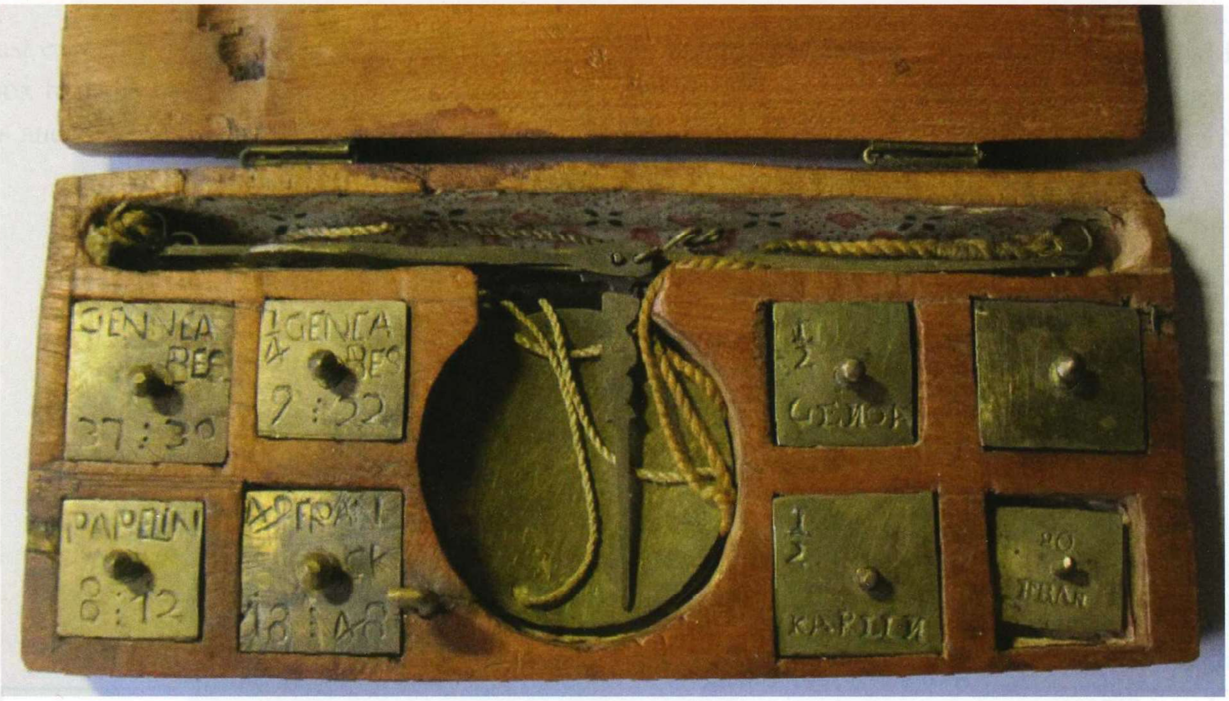


Figure 18.

There is room for seven coinweights (Figure 18), most of them fit quite well into their spaces. The four left ones are one group due to type and inscription. Two of the three on the right (1/2 Genoa and 20 Fran) match as well.

There are still several riddles about this box, one of those was solved recently:

> What do the additional inscriptions of the coinweights on the left tell us? Finally it can be shown, and that allows us an idea about timing and about the region, that the numbers give the value of the coins in Austrian Florin and Kreuzer[17]. Therefore, the box must have been made in the part of the North of Italy which was dominated by the Austrians in the early 19th century but after 1815 (and probably not from the kingdom of Lombardo-Veneto).
>
> But why do the masses of several weights not fit? The piece for 96 Lire from Genoa (GENNEA BES) weighs 13,10 g instead of 25,2 g; that for the 40 Francs (FRAN=CK) weighs 6,85 g but should be 12,9 g (two excellente from Spain?). A ½ Karlin with 7,64 g? No Karlin around in the area, only some Carlino's (Piemonte, Sardinia, Naples) which should not match either. The mass may fit for a Louis Neuf so it could be a special correction by the owner (and it looks heavily worked on) which still would not explain why the coinweight is heavier than the Bavarian ½ Karlin. The spaces are filled with paper to allow the weights to fit well. In the case of the coinweights bearing Austrian values, the values agree for coins named on the weights, but not for the actual mass, if different.

The second box can be seen as Italian only by the composition of the coinweights. The elaborate hinges are striking, we are not aware of a similar box till now.

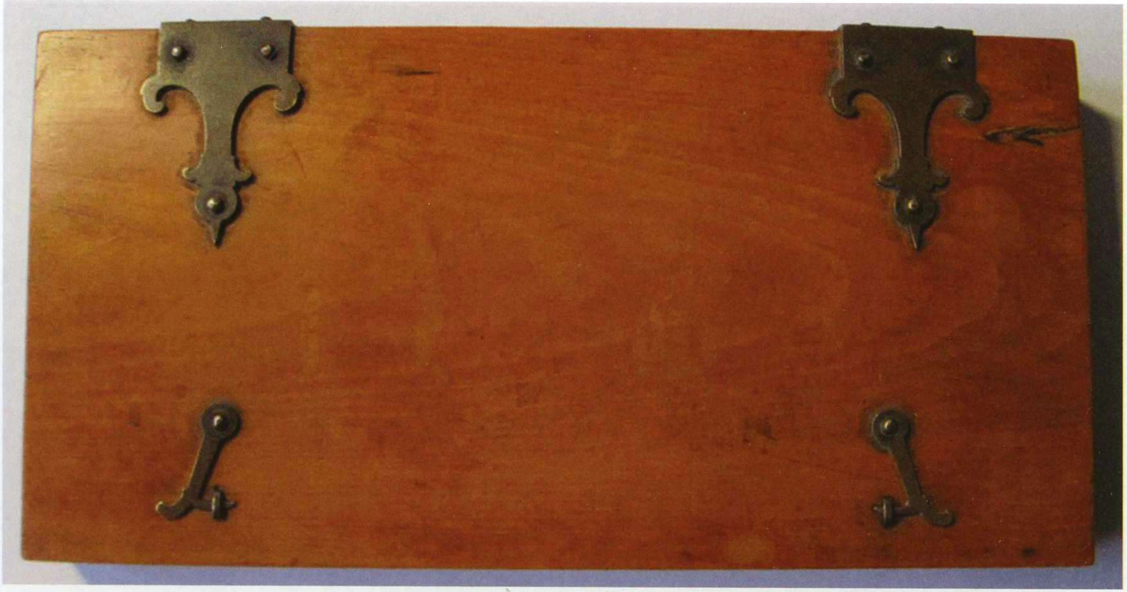


Figure 19. ⩓⩓ Box from Northern-Italy with unusual hinges and closure.

The composition of the box appears to be:

Inscription	Coin	Actual mass
1 G	96 Lire Genua	25,42 g
G/2	48 Lire Genua	12,75 g
1 L	1 Louis	15,31 g
L/2	½ Louis	7,67 g
1 S	Souverain	11,07 g
S/2	½ Souverain	5,58 g
1 F	Flemish Souverain?	11,06
F/2	½ Flemish Souverain?	5,58
1 D	Dukat	3,55

Since there are no weights for 40 and 20 Francs, the box may be before Napoleon occupied Italy. There are two pieces of the same mass but with different inscription, strange for such a small box. And what exactly is F standing for? The most logical explanation could be the Flemish Souverain.

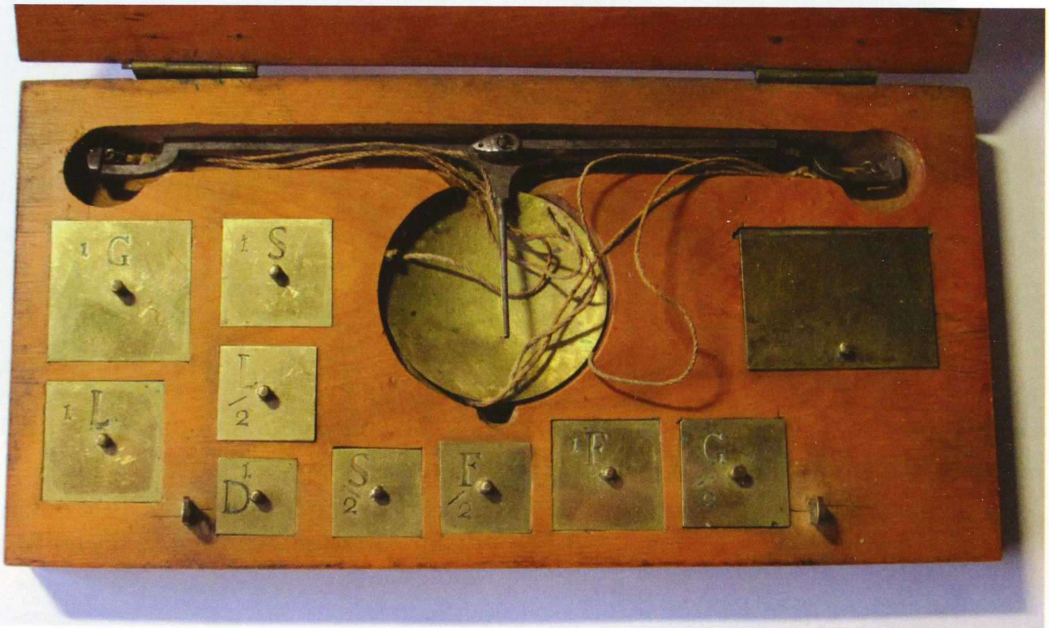


Figure 20. ⩓⩓ View inside the box.

The last example is a box (Figure 21) having coinweights for Genoa, the Papal States, Austria and France. The box has similarities to ones made in Nuremberg, but there are also clear differences like rather simple hinges and the whole construction of the box. Therefore, I tend to believe that it was not made in Nuremberg.

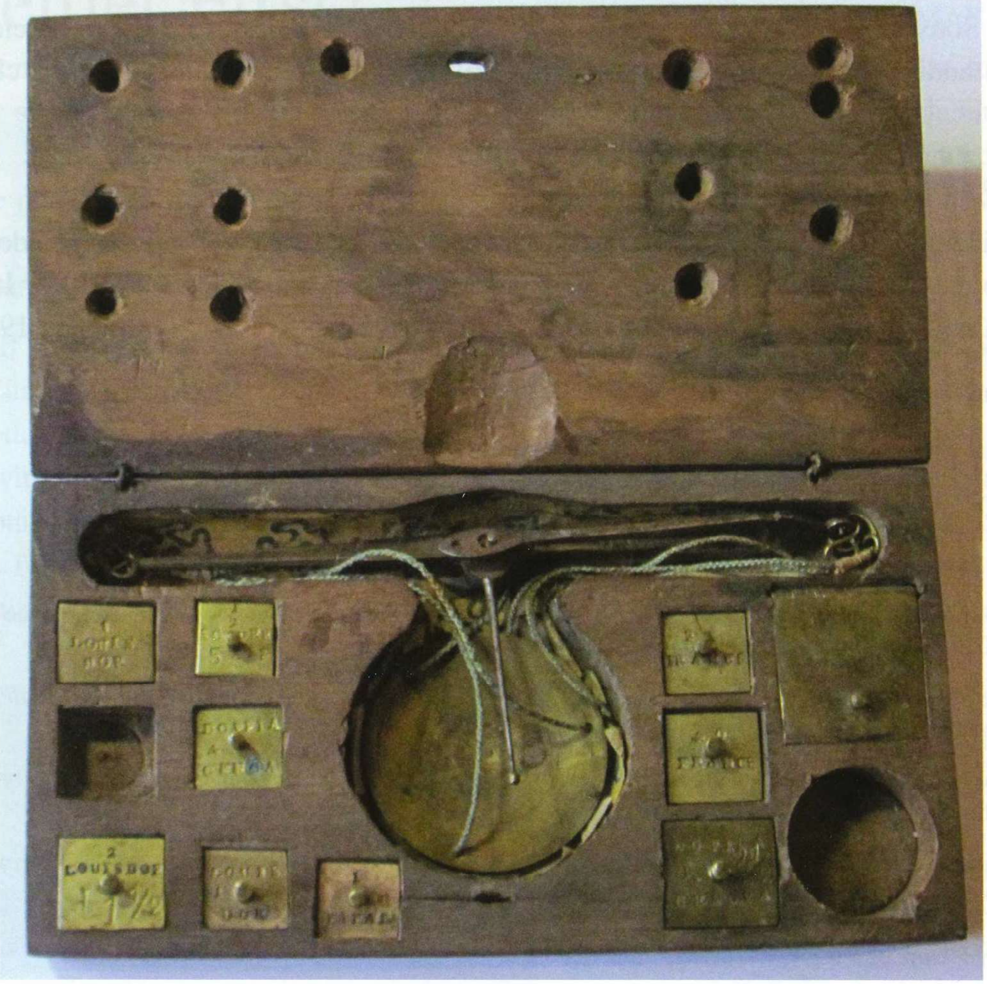


Figure 21. ⮝⮝

Due to the pieces for 20 and 40 Francs the box should be from the first half of the 19th century.

Coin	Actual mass	Additional Marks	Remarks
1 LOUIS/D'OR	7,63 g		added later
½ SOUVER/AIN	5,03 g	5	
DOPPIA/GENOA	6,30 g	4	
2 LOUISD'OR	15,31 g	1 ½ plus reversed 1	
LOUIS/1/D'OR	7,66 g		
1 PAPAL	5,31 g	5	Papal States
20 FRANCS	6,45 g		
40 FRANCS	12,91 g		
DOPPIA/1/GENOVA	24,75 g	2 ½	Should be 25,3 g

As the weight for 1 Louis d'or without lift pin is surely a later addition, two of the original coinweights are missing. The further 8 maybe from one maker as the pins are quite similar. Missing are probably coinweights for 1 Souverain and 48 Lire from Genoa. The mass of weight for 96 Lire is clearly too low. The reason for the additional numbers is unclear and also that of the round space, also the closure seems to be missing.

H. Italy (after unification)

After the unification of Italy was finalized in 1871, coin scale boxes continued to be made. There are examples similar to the Milanese boxes and the late Austrian ones. Those boxes are only for Italian gold and silver coins with units in lire. Verification marks on coinweights can be found until about 1930.

Notes & References:

1. My special thanks go to Guido Zavattoni and Gary Batz for friendly comments and suggestions.
2. Except: G.Zavattoni, "Milanese coin boxes in 19th C.", *Equilibrium*, 2357, 1999
3. As far as I know, also none in Dutch or French.
4. Among others: Bilance e Strumenti per pesare le Monete (metà XVII – XX secolo) di una collezione privata, Campogalliano, 2003 (with an English introduction), further volumes are in preparation
5. A volume of 60 pages dated 1750 *Istruzione per li Fabbricatori ed Aggiustatori delle Bilance, Stadere e Misure* may be found, complete, at Google Books
6. In view of the multitude of coinweights in the boxes, it remains moot whether this was taken literally. Yet typically, weight for denari are present in the boxes.
7. Verification marks and also some marks of weight makers may be found in the present issue of *Europaeische Eich-Zeichen* (EEZ) published by the German association Maß&Gewicht.
8. In spite of this, there is reason to believe that picture weights made in Lyon were further fabricated in Turin.
9. 1 Denaro=24 Grani; 1 Grano=24 Granottini (1,281g; 0,0534g; 0,00222g), showing extreme exactness.
10. Guido Zavattoni gives an example of a box by the Lyon maker Nicolas Raybay of 1693 with Genoa-made coinweights: *Numismatica* Wien VI, n.54
11. A.Buti, G.Zavattoni; *I pesi monetali per le monete di Genova*, Genova, 7/2013
12. The Austrian Hapsburgs succeeded to the Spanish occupation of Lombardy.
13. Compare: *Il leone e la bilancia*, Academia Italiana di studi numismatici; Guilio Gianelli e Guido Zavattoni, Exhibitioncatalogue 2003
14. Renzo Bruni; *Un'inedita scatola con bilancina e pesi monetali di probabile produzione Bolognese, Panorama Numismatico* 11/2014
15. C is for Carlos and F for Fernandino, both with different numbers as kings of Sicily, Naples and the Kingdom of The Two Sicilies.
16. Guido Zavattoni has doubts about this in view of the attribution of the box to the 19th century since Milan had been under Austrian occupation for an extended period..
17. We found this statement of value in several boxes from Northern Italy.

The Bochkoltz Substitution Balance, or: Was Mettler First?

BY THOMAS ALLGEIER

Fellow ISASC member and metrology historian Ritzo Holtman is in the enviable position to be sent, apparently in steady succession, emails about interesting "finds" of high significance which sometimes border on the unique. Some of these he brings to my attention, in particular if they have a connection with the Jenemann archive project, our joint venture of recent years. Those are the moments when we clearly see the value of our work in trying to preserve and make accessible to the general public what Hans had accumulated throughout his life.

In the second half of the 1940s a revolution began, from humble beginnings, in the unlikely place of Küsnacht, near Zürich, Switzerland. There, two intrepid instrument designers gave the world the first commercially produced - and very successful - substitution balance for chemical weighing. For those of you not familiar with the concept, a substitution balance has only 2 knives: One carries the beam, and from the other hang both the load and the weights. On the opposite end of the beam is a fixed counterweight. The weight set is fully applied when the balance is unloaded, but is partially lifted clear of the beam by operator intervention after load has been applied to the pan. In equilibrium, load applied = weights removed.

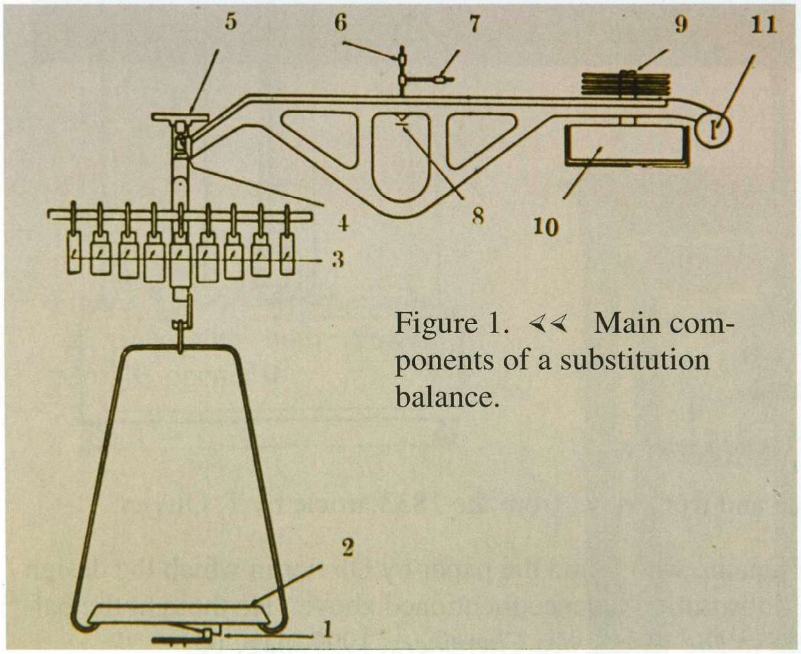


Figure 1. << Main components of a substitution balance.

The design was of such brilliance that it completely replaced (displaced?) the more traditional three-knife-balance, to the point that it was the last great hooray of the mechanical brigade before electronics took over. From the 1950s onwards you either offered a substitution model or you went out of business as a maker of analytical balances.

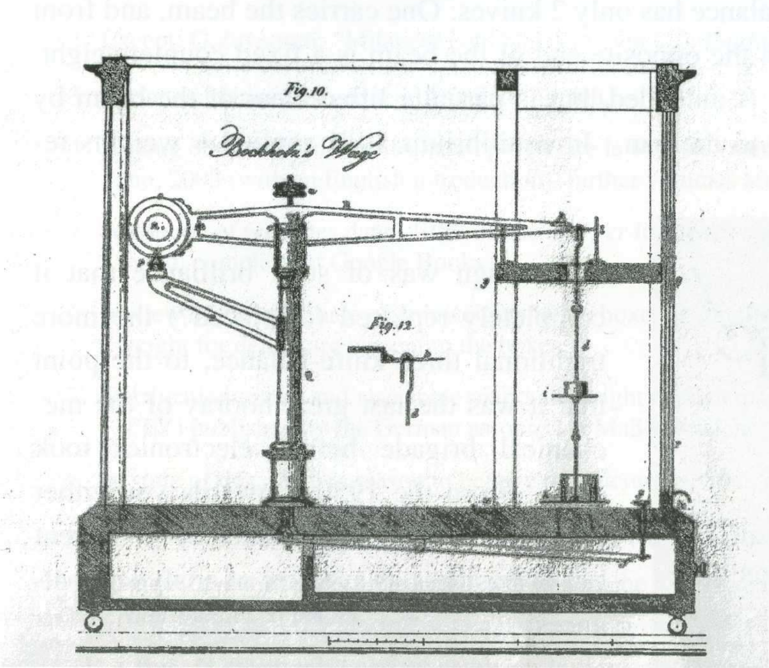
However, Messrs Mettler and Meier (the two gentlemen in question) failed to protect their design with a patent, at least with a fundamental patent, since their "invention" was not new. It was, in fact, nearly two hundred years old, except that nobody had managed to exploit the superior substitution principle, to the point that it had largely been forgotten by the time our Swiss friends arrived on the scene. The story about why the design was so successful, what it took to overcome the hurdles which floored their would-be predecessors and how they stayed ahead of the game even without a patent has been well documented - mostly by Hans Jenemann, incidentally:

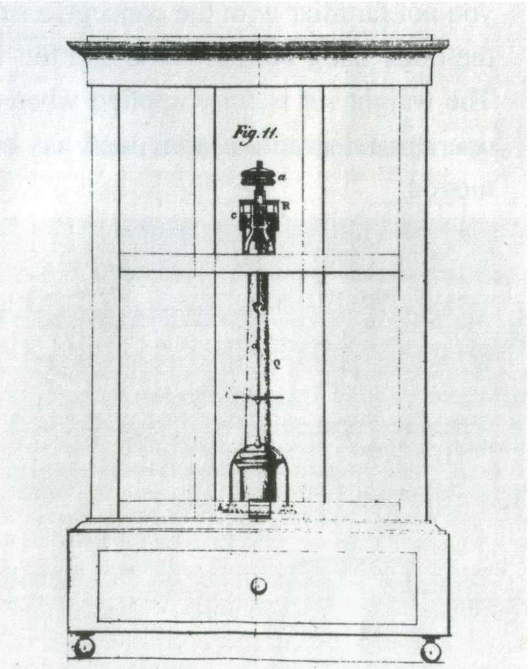
Die frühe Geschichte der Mettler-Waage, published in 1992, details the early history of Mettler as a company and the Mettler balance as an instrument for the chemical laboratory, from the very beginning 1945 until about 1967.

Then there is *Zur Geschichte der Substitutionswägung und der Substitutionswaage*, published ten years earlier. This is Jenemann's main contribution to the subject, it covers both the process of weighing and the balances, in a historic context but also going into technical details of design and construction.

An even earlier paper from 1978, *Zur Geschichte der Substitutionswägung zur genauen Massenbestimmung (Borda'sche Wägung)* focuses on the process of substitution weighing and its history without looking at the balances used for the purpose, tracing it back to the mid-18th century.

So here we have a case where the advantages of a new approach had been recognised, where the mathematics behind had been formulated and understood, and where that accumulated knowledge had even been published, but where nothing had actually been made or sold to bring the design to the user. Nothing? Well not quite. A Mr Wilhelm Christian Bochkoltz (1810-1877, unfortunately often misspelled Bockholtz) in 1833 proposed a design for just the very thing we are talking about: A two-knife edge, substitution balance for analytical purposes, in a glazed wooden case, rotated through 90 degrees so that the beam pointed towards the operator, useable by right-handed and left-handed people with equal ease. Not so far away from Messrs Mettler and Meier, you would have to admit. (Of course they would add a rather brilliant weight-loading mechanism, air damper and optical projection and end up with a world-beater.)





Figures 2 & 3. ∧∧ Bochkoltz balance, side and front view, from the 1833 article by T. Olivier.

The thing did not escape the attention of Hans Jenemann, who found the paper by Olivier in which the design was described, and quoted it in his treatise on the substitution balance mentioned above. He thought the balance significant enough to include the drawing also in *Die Waage des Chemikers*, 1997, page 63.

So in one sense Mettler and Meier had a true forerunner, albeit some 110 years ago! Olivier's report states that the Bochkoltz balance was made in the workshop of Deleuil in Paris which was very famous in the 19th century. Of course we have no information about how many were made; this author thinks probably not very many. According to Jenemann it appears to have found little appreciation in that other makers did not adopt the design and it disappeared from the scene soon afterwards. The last mention we have come across was in an 1837 technical dictionary, *Dictionnaire de l'industrie* by Baudrimont et al.

It is unlikely that Hans Jenemann had ever seen a Bochkoltz balance, very definitely his image collection contains no pictures in this respect. So, did any of the Deleuil-made instruments survive?

Yes - and we can show documentary proof:

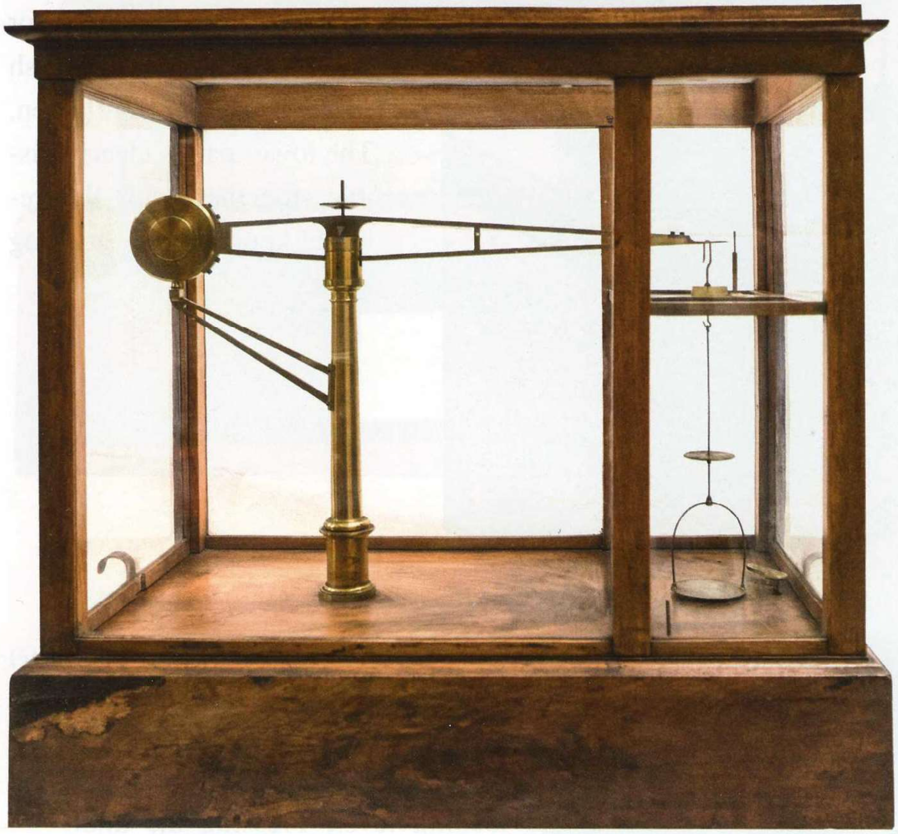
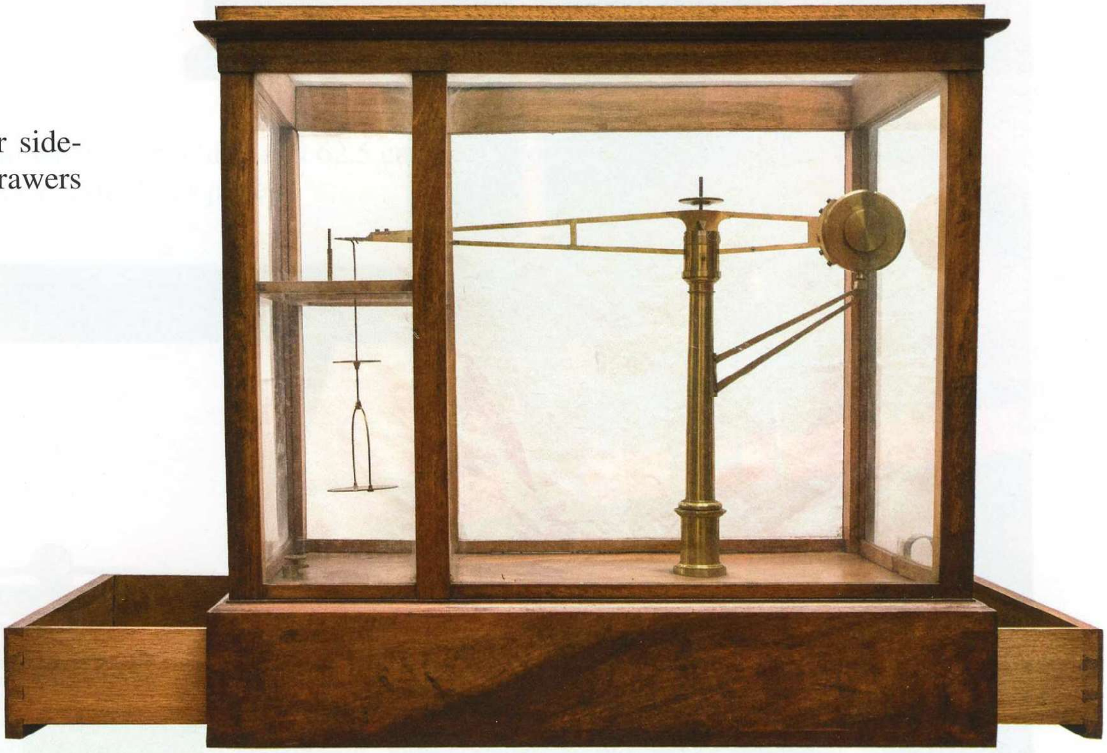


Figure 4. ⪡⪡ The Bochkoltz balance at the Physics department of Lyon University, France. Clearly seen is the asymmetric beam with the prominent counterweight at the left end. On the right hand side the separate weighing chamber with its two pans, the lower one for the unknown mass (sample) and the upper one for the weights.

Figure 5. ⪢⪢ Another side-on view with both drawers partially opened.



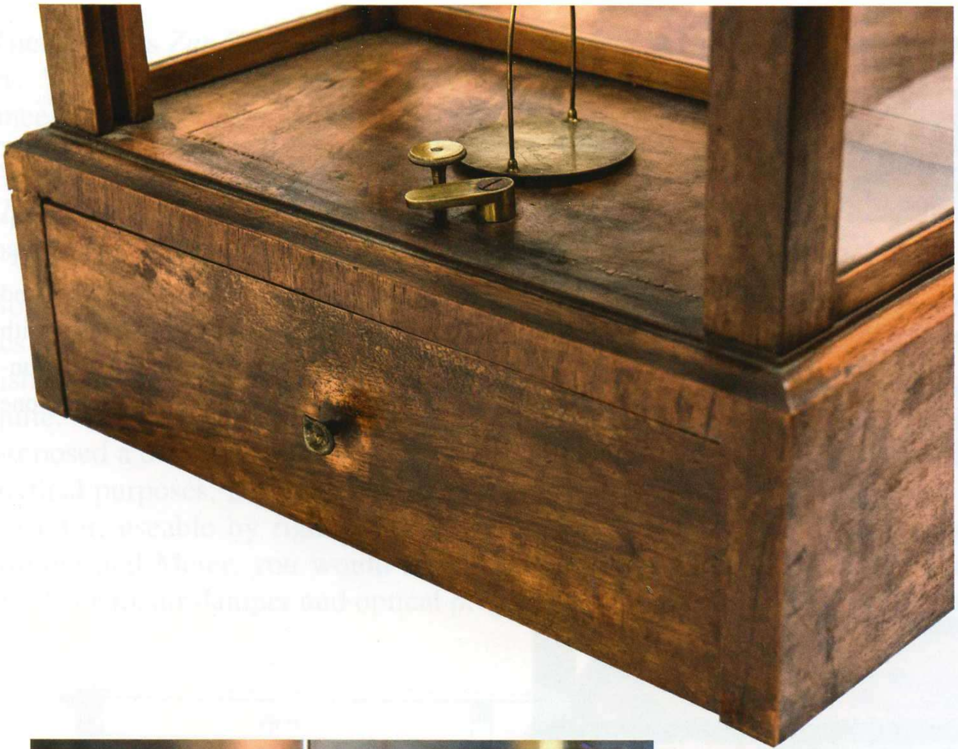


Figure 6. ≺≺ The end-on view which the operator would have seen, with sash window at the front open. The lower pan is clearly visible, together with the release knob and a locking lever.

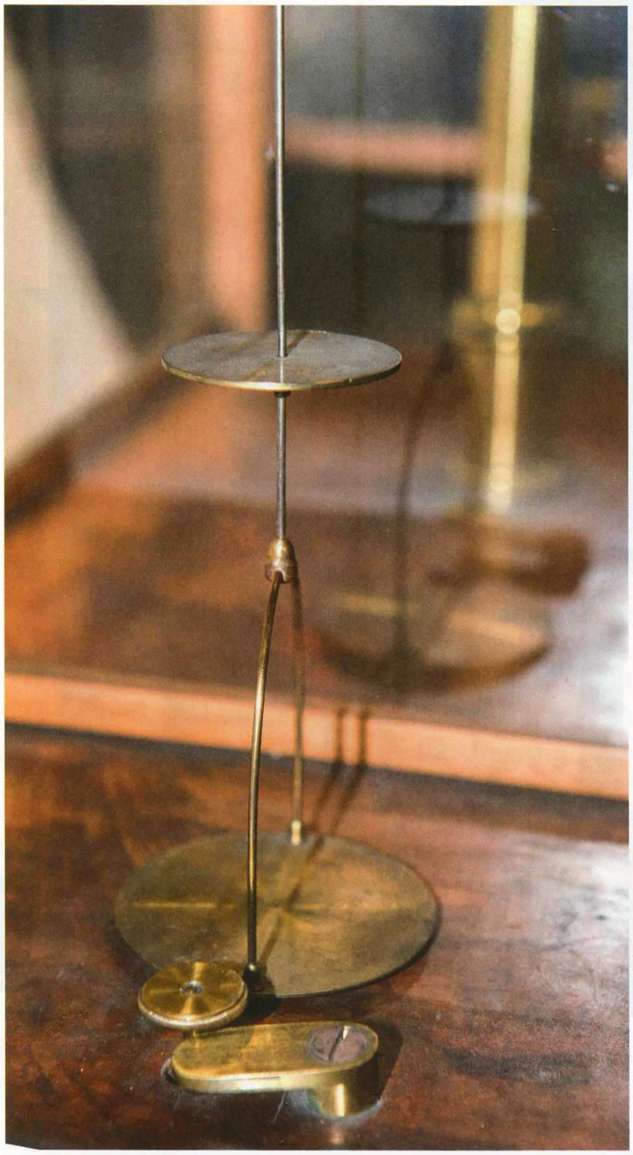


Figure 7. ≺≺ A close-up of the pans, release knob and locking lever. Pressing the knob raises the main plane and releases the beam.

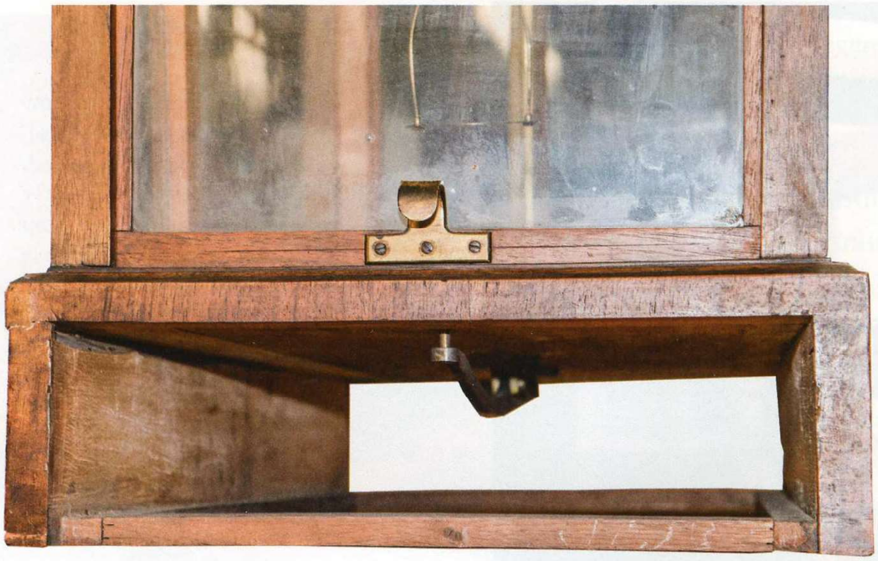
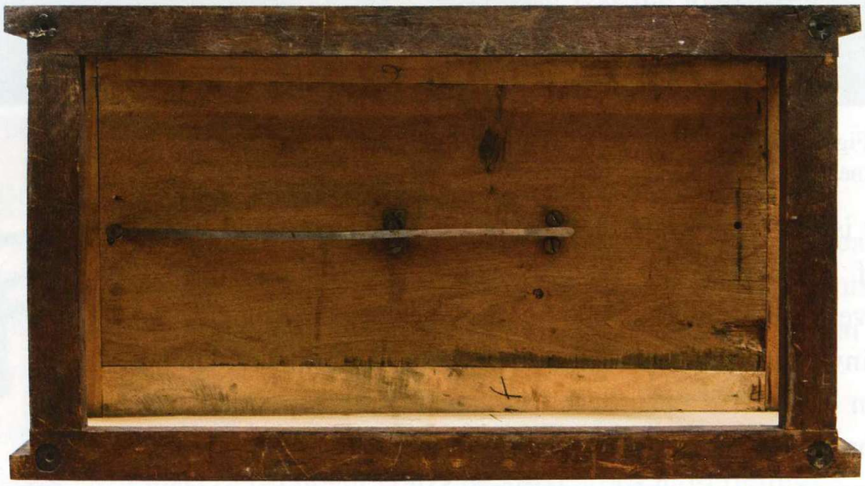


Figure 8. ≺≺ A view from the front with the drawers removed, showing the release lever.

Figure 9. ≻≻ The underside of the balance with the drawers removed, showing the release lever which raises the control rod when the knob is pressed.



The balance case is 35 cm wide, 58 cm high and 62.5 cm deep. Notice the almost perfect match in all details with the drawings from the 1833 paper.

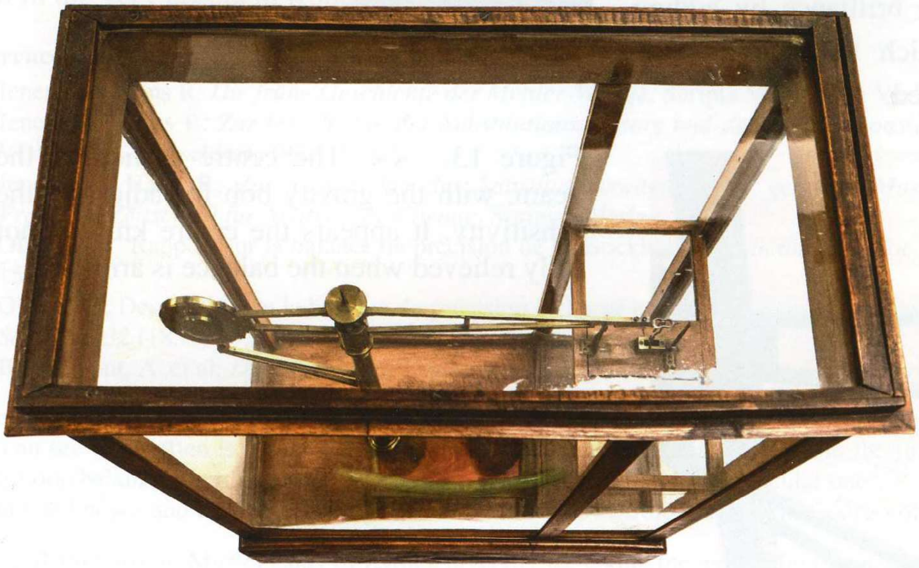


Figure 10. ≺≺ The view from the top. The weighing chamber is separated from the space enclosing the beam.

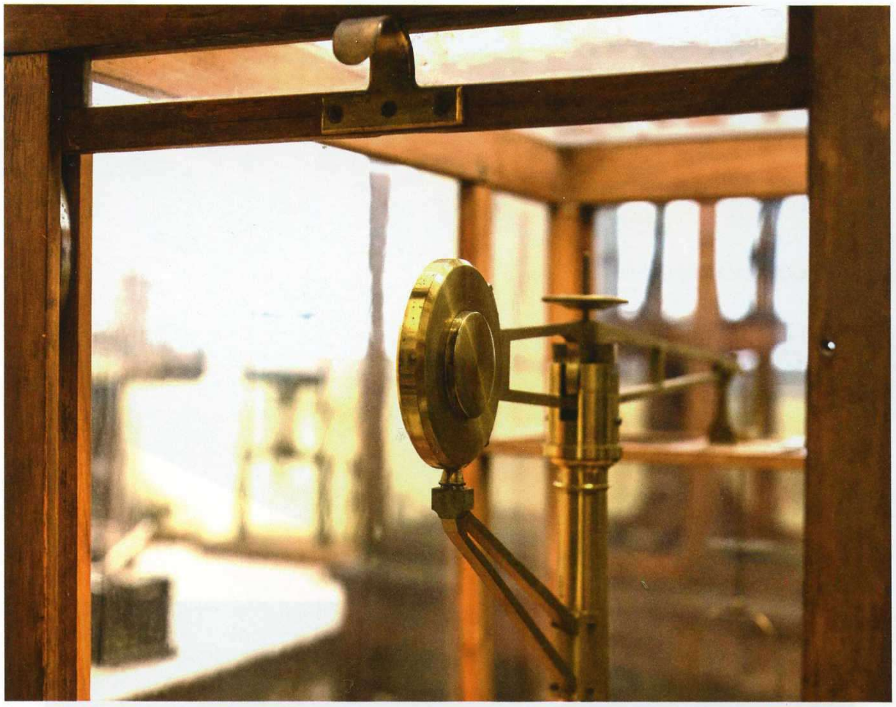
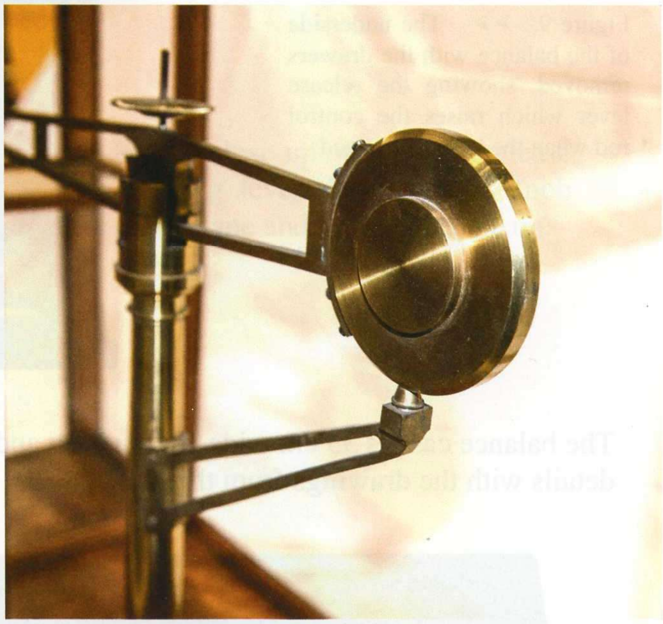


Figure 11. ≺≺ The view from the rear of the case, with the sash window raised. The counterweight is clearly visible, together with the stop it rests on when the balance is arrested.

Figure 12. ➢➢ A close-up of the counterweight and its attachment to the beam.



It is quite plausible that Mettler and Meier never knew of the existence of a practicable forerunner of their eventual design; they have always claimed that they "invented" the substitution principle, only learning later on that it had been described several times previously throughout two centuries. Hans Jenemann followed that argument, which was supported by personal correspondence he had with Hans Meier. So, full credit to them for revolutionising the weighing process in the chemical laboratory. In any case, as mentioned earlier they displayed their engineering brilliance by adding significant features without which the whole affair would probably not have succeeded.

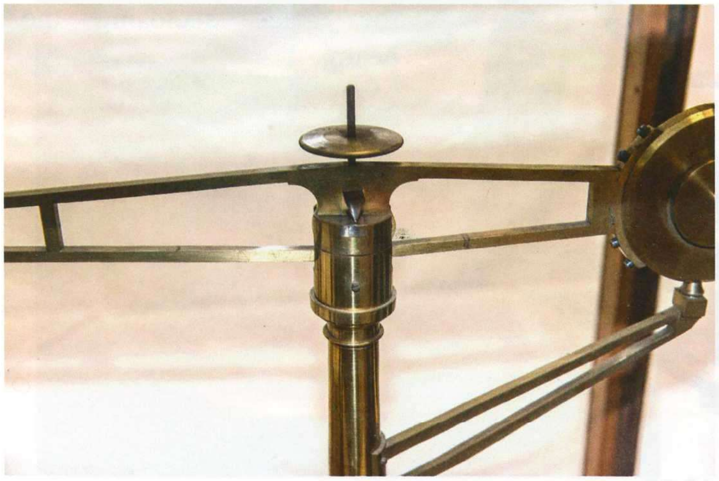


Figure 13. ≺≺ The centre section of the beam, with the gravity bob for adjusting the sensitivity. It appears the centre knife is not fully relieved when the balance is arrested.

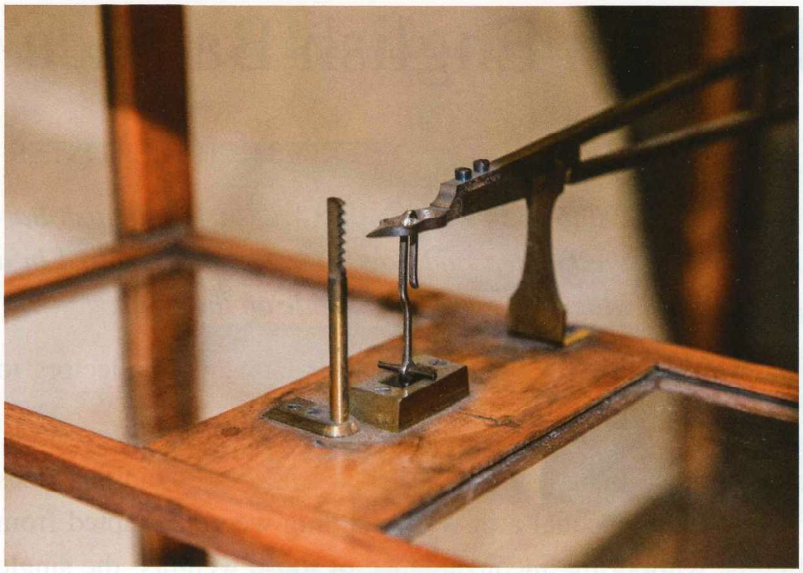


Figure 14. << The end knife, beam support, pointer and "chart". The equilibrium appears to have been read against the notches in the brass rod opposite the pointer.

But let's also celebrate Mr. Bochkoltz who must have been following a very similar thread in his mind more than 110 years earlier, showing great foresight at the tender age of 23 years. How far he was ahead of his time only becomes clear when we realise that a whole generation of chemists would be trained, work and retire before Paul Bunge delivered them from the evil that was the long-beam balance - but still mounting 3 knives to each beam. Thereafter, Germany as a nation would be founded, the century turned, two world wars were fought, until finally our two Swiss entrepreneurs placed in front of the lab dwellers something that had actually been built at least once all those years ago.

How did we get hold of these pictures? Back to the very beginning:
Françoise Khantine-Langlois of the Physics department of Lyon University in France contacted Jean François Loude, asking for help in identifying the balance depicted in figures 4-14 which is part of their historic collection. Jean François - our Swiss friend who is a very active collector and researcher/historian - forwarded the enquiry to Ritzo, with whom he is in frequent contact.

My fellow custodian of Jenemann's archive does not only have umpteen computer hard disks full of Hans' writings, pictures and a great number of instrument maker's catalogues, no - he also carries most of this around in his head. Therefore he recognised the balance immediately as the Bochkoltz depicted in the paper on substitution balances mentioned previously. A reply was quickly composed and sent to Françoise, complete with excerpts from that paper, together with a request for more pictures and seeking permission to use them in the very article in front of you.

References:

1. Jenemann, Hans R: *Die frühe Geschichte der Mettler-Waage,* Scripta Mercaturae Verlag, St. Katharinen, 1992
2. Jenemann, Hans R: *Zur Geschichte der Substitutionswägung und der Substitutionswaage*, Technikgeschichte Bd. 49 Nr. 2, VDI Verlag, Düsseldorf, 1982
3. Jenemann, Hans R: *Zur Geschichte der Substitutionswägung zur genauen Massenbestimmung (Borda'sche Wägung), Fresenius Zeitschrift für Analytische Chemie*, Springer Verlag, 1978
4. Olivier, T: "Rapport sur la balance de précision de M Bockholtz". *Bulletin de la Soc. d'Encouragement* 32 (1833), pp. 148 – 150
5. Olivier, T: Description de la balance de précision à charge et sensibilité constants, inventée par M Bochkoltz de Treves. Bull. *Soc. Enc. 32* (1833) pp. 334 – 338
6. Baudrimont, A. et al: *Dictionnaire de l'industrie, manufacturiére, commerciale et agricole*, Brussels, 1837

Acknowledgements:

You can see as so often is the case that the author contributed the least amount to the finished product (I had of course read the substitution balance paper years ago but would never have recalled that particular one…). As they say it is not what you know but whom you know - and I am lucky and grateful to know that metrology enthusiast extraordinaire Ritzo Holtman!

Special thanks also to Michel Cuny of Lyon University for taking the wonderful pictures especially for this article.

A 19th century Multi-Coin English Balance Maker - John Alker

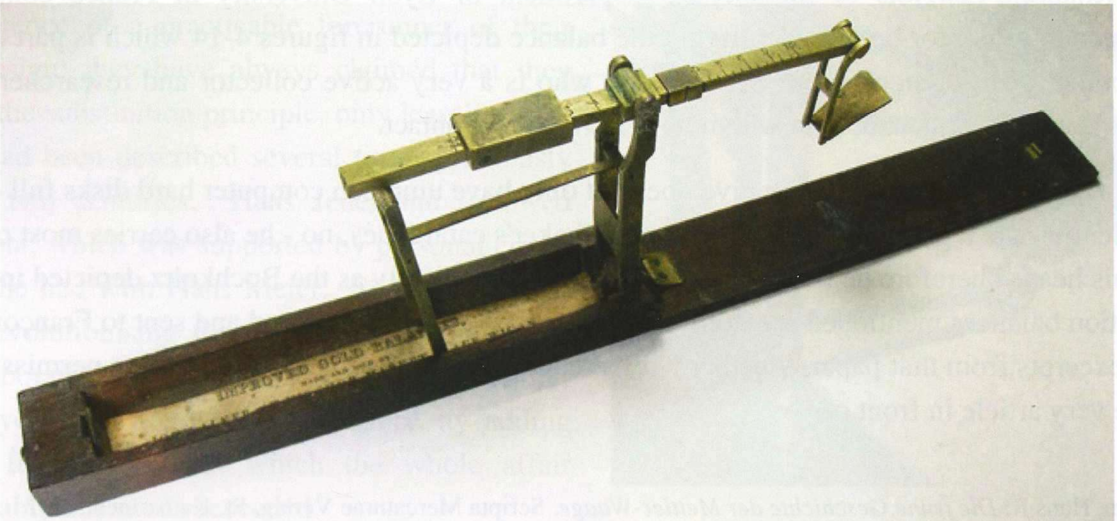
BY MICHAEL FOSTER

John Alker senior, Watchmaker working in Wigan from c.1790 to 1834 was another Multi-Coin English Balance maker. Alker's solution to eliminating the need for the Guinea and Sovereign weights resulted in a folding coin balance design utilizing a sliding poise weight with a 'missing value' slide on the beam.

Small folding coin balances were carried by merchants, tradesmen, gentlemen and revenue collectors to check the weight of the domestic and foreign coins that passed through their hands.

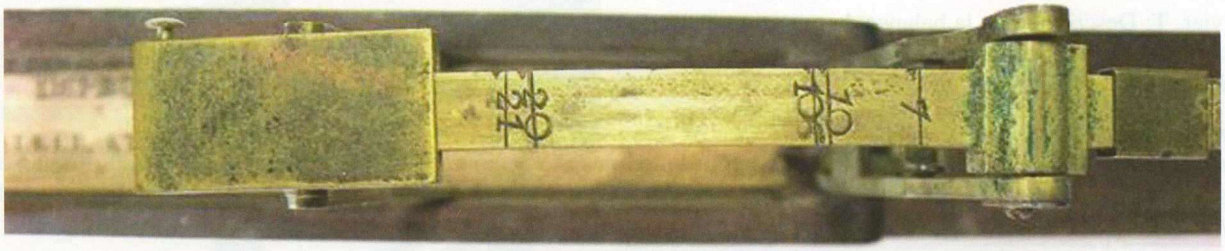
Four major types of folding gold balances were available: the equal-arm, adapted from traditional balances into the folding type that required loose coin weights; the unequal-arm with a sliding weight, adapted from the steelyard, accommodating a wide range of coins without the inconvenience of loose weights; the single turn-poise, in which a hinged poise moved from one position to another, for weighing the guinea and half-guinea, and in 1798 the double turn-poise type which could weight a third guinea fraction, the seven-shilling piece.

A Wigan based watchmaker, John Alker designed a multi-coin folding unequal-arm balance using a sliding-poise on a beam, instead of the popular turn-poise solution.



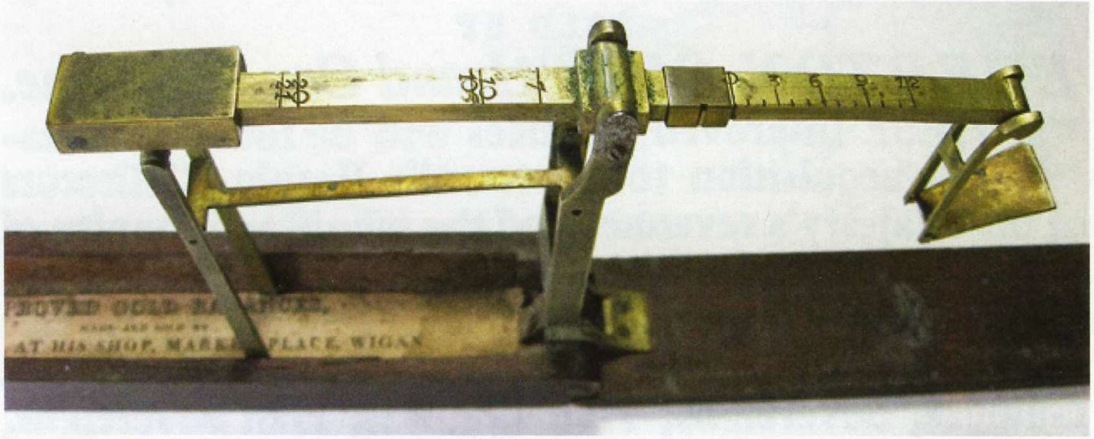
John Alker Folding Multi-coin Sliding-poise Balance set to test a Half-sovereign

The beam is graduated for 5 coins, the Guinea 21s, the Half-guinea 10s 6d, the Third-guinea 7s and the Sovereign 20s and Half-sovereign 10s.



Beam showing the Sliding-poise and the Poise set markings: 21, 20, 10.6, 10 and 7

Note the sliding-poise has a button on the side to release the poise to move to a new setting on the beam.



Beam with Sliding poise and Missing value slide 0-12 pence on plate side

The missing value slide graduated from 0-12 pence was on the load arm of the beam.

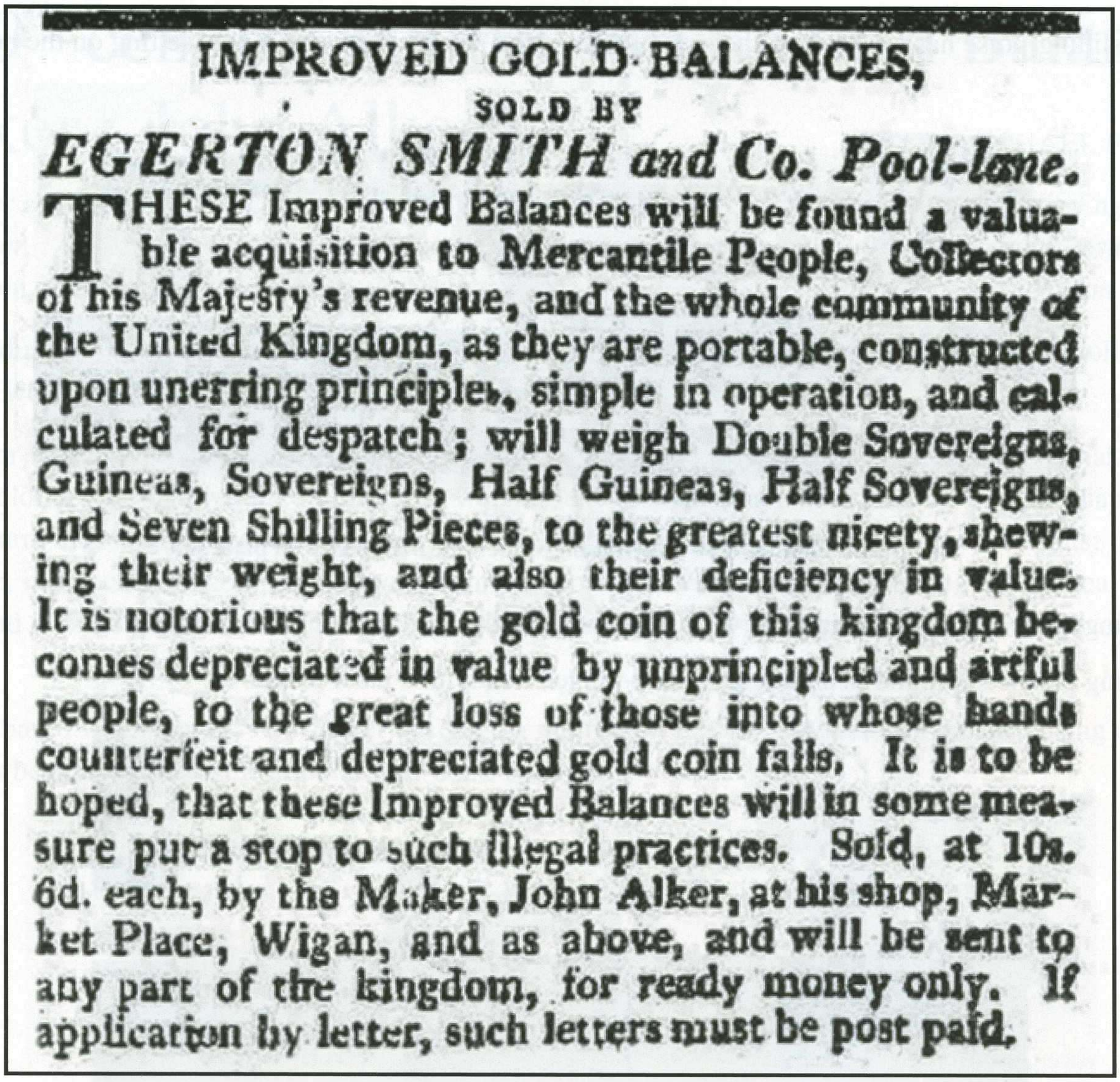
This folding balance is found in a mahogany end-hinged box with a label inside.

John Alker box label

Box label reads; "IMPROVED GOLD BALANCES, / MADE AND SOLD BY / JOHN ALKER, AT HIS SHOP, MARKET-PLACE, WIGAN"

This balance was introduced after the Great Recoinage Law of 1816 and the 1817 introduction of the gold Sovereign and Half-sovereign.

From the *Liverpool Mercury*, 24 October 1817, an Advertisement for Improved Gold Balances, to weigh Double Sovereigns, Guineas, Sovereigns, Half Guineas, Half Sovereigns and Seven Shilling Pieces. Sold by Egerton Smith and Co. Pool-lane, Liverpool for 10s 6d, and made by John Alker at his shop, Market Place, Wigan.



IMPROVED GOLD BALANCES,

SOLD BY

EGERTON SMITH and Co. Pool-lane.

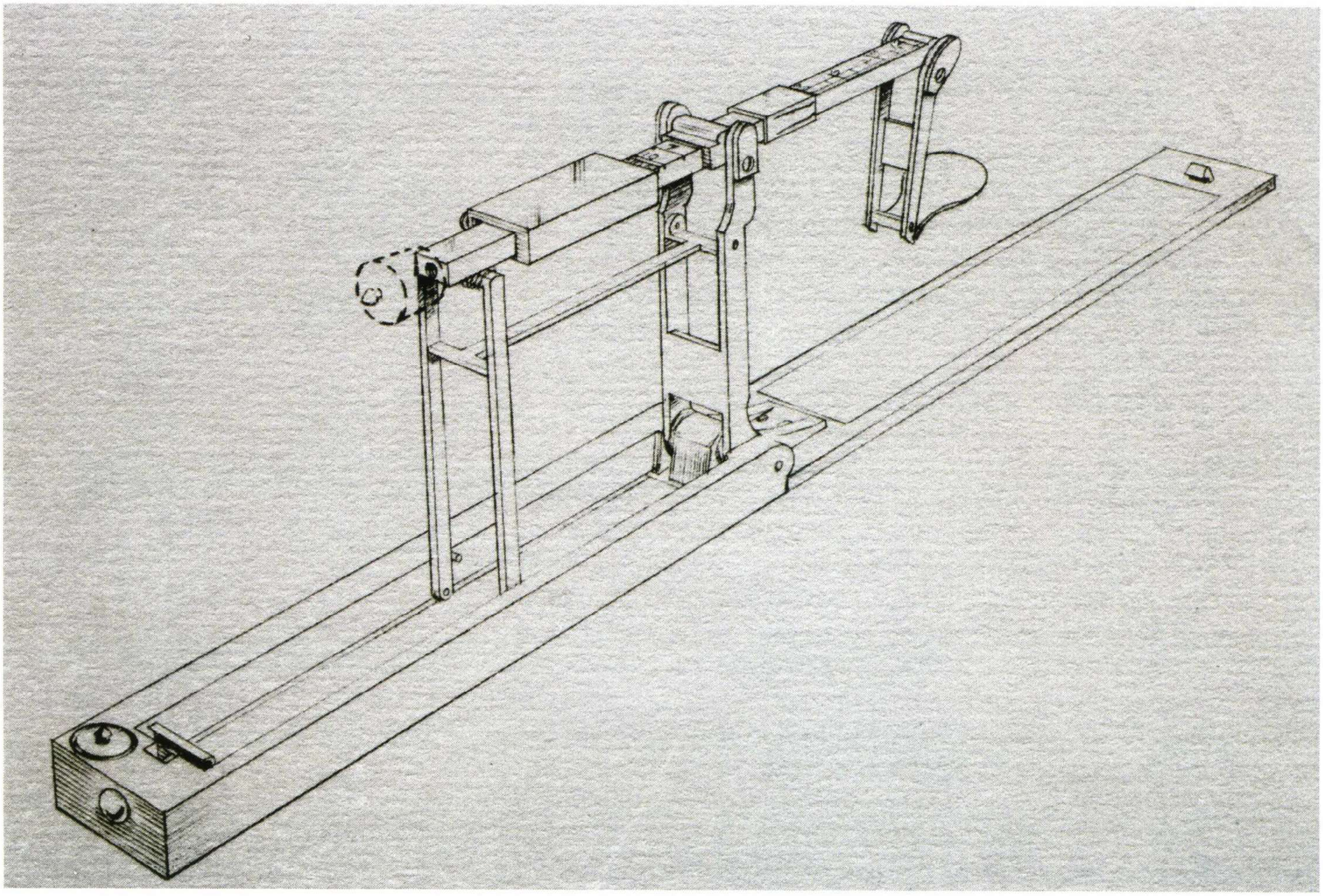
THESE Improved Balances will be found a valuable acquisition to Mercantile People, Collectors of his Majesty's revenue, and the whole community of the United Kingdom, as they are portable, constructed upon unerring principles, simple in operation, and calculated for despatch; will weigh Double Sovereigns, Guineas, Sovereigns, Half Guineas, Half Sovereigns, and Seven Shilling Pieces, to the greatest nicety, shewing their weight, and also their deficiency in value. It is notorious that the gold coin of this kingdom becomes depreciated in value by unprincipled and artful people, to the great loss of those into whose hands counterfeit and depreciated gold coin falls. It is to be hoped, that these Improved Balances will in some measure put a stop to such illegal practices. Sold, at 10s. 6d. each, by the Maker, John Alker, at his shop, Market Place, Wigan, and as above, and will be sent to any part of the kingdom, for ready money only. If application by letter, such letters must be post paid.

***Liverpool Mercury*, 24 October 1817**

This October 1817 Advertisement claiming that John Alker's Improved Gold Balance could weigh Double Sovereigns was ahead of its time. The Double Gold Sovereign was announced in the Great Recoinage Law of 1816. However, the Mint was in no hurry to make them. A pattern was produced in 1820, but the coins weren't minted until 1823.

So Alker had anticipated the minting in the Advertisement and when the Double Sovereign went into circulation in 1823 he created a variant of his balance design illustrated in Figure 11 of "Weighing Coins" by Michael A. Crawforth.

The variant had a special loose weight in the box that could be screwed on to the end of the beam to weigh the Double Sovereign which was really only minted from 1823 to 1826.



M. A. Crawfoth Figure 11: John Alker Balance

Directory listings and References for John Alker, senior at 23 Market Place, Wigan, Lancashire:

John Alker, senior

c.1790	Business started. Reference: A. J. Hawkes, *Clock and Watchmakers of Wigan*
1809-11	Clock and Watchmakers, Market Place, Wigan. Reference: *Holder's Directory*
1814	Watchmaker. Reference: *Commercial Directory*
1824-25	Watchmaker. Reference: *Baine's Wigan Directory*
1828, 1834	Watchmaker. Reference: *Pigot's Directory*

Directory listings and References for Thomas Alker and John Alker, junior at 23 Market Place, Wigan

Thomas Alker and John Alker, Junior

1838	Thomas Alker running business. Reference: A. J. Hawkes, *Clock and Watchmakers of Wigan*
1852	John Alker took over. Reference: A. J. Hawkes, *Clock and Watchmakers of Wigan*
1855, 1856	John Alker, junior, Reference: *Slater's Directory*

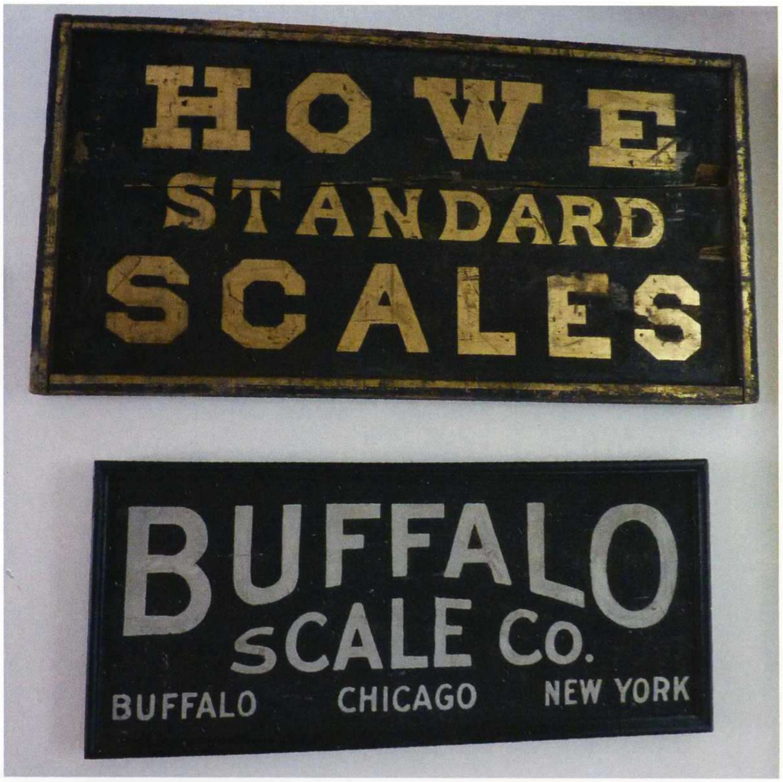
Acknowledgements:

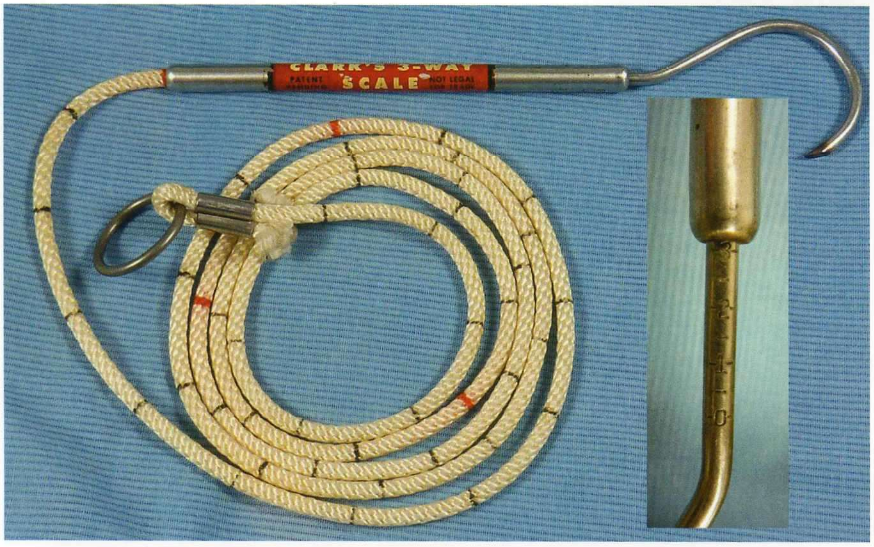
The author would like to thank Eric and Judy Soslau, Diana Crawforth-Hitichins and the Crawforth Index for their assistance in this article.

Showcase

Wooden scale advertising signs like the ones on the right make a nice addition to any scale collection. Used in the late 1800s and early 1900s, they are rarer and harder to find than their porcelain over steel counterparts used in the 1920s to the 1950s. Both of these examples are on black painted wood and the buffalo one has gold metallic lettering.

Jerry Katz Collection.



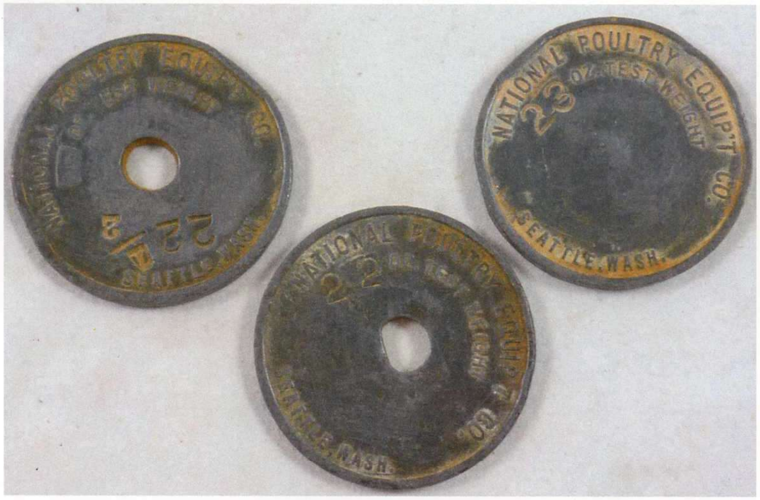


The fish stringer shown at left is labeled Clark's 3-Way "Scale". It measures fish by the inch and foot and also gives its weight on a spring scale (see inset) for any fish hooked on the end. It can also be used as a stringer to weigh a mess of fish. While it will measure a four foot fish; the stringer is nylon which tends to stretch when wet.

Jan Berning Collection

The egg scale test weights were made by National Poultry Equip't Co. in Seattle Washington. They are made of lead and stamped for testing 22½, 22 and 23 ounce eggs per dozen to assure the accuracy of an egg scale.

Private Collection.



ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2016 ISSUE NO. 3 PAGES 4273 - 4300

Cover Picture

September of 2016 is the 40th Anniversary of the founding of ISASC which makes it a perfect time to review the exciting early years of its lifespan. In the article *The Spirit of ISASC's Founders* you will read a first-hand account of those years from one of the earliest members. We hope you enjoy it.

Contents

Spanish Coin Scale Boxes, Part 5
Ludwig Ramacher & Francisco Vallés 4275– 4283

The Ketchum Glove Measuring Device
Don Schoenly 4244-4286

The Spirit of ISASC's Founders
Utz Schmidt 4287-4300

ISASC
INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

EQUILIBRIUM is published quarterly in February, May, August and November.

© 2016 International Society of Antique Scale Collectors ISSN: 0893-2883

International Society of Antique Scale Collectors
Founded September 1976
Internal Revenue Service 501 (c) (3) EIN 36-2976411
Tel 612.925.1386
www.isasc.org

Officers 2016

President........................ Bob Hayden
Vice Presidents..................... Greg Hill
.... Jerome Katz
.... Greg Moss
...........................Mary Anne Murphy
............................Shirley Schmidt
Secretary...................... Carol Hayden
Treasurer....................... Kurt Beyreis

For membership information contact
Shirley Schmidt sschmidt@avci.net
5790 N. Lakeshore Rd. Palms, MI 48465

Published with the co-operation and support of
ISASC Europe
Founded October 1993
Charity commissioners for England & Wales No 1037558
www.isasce.com

Trustees and Officers 2014-2016*

Chairman.................... John Knights*
Secretary.................. Thomas Allgeier*
Treasurer.....................Mike Sharpe*
Meeting Secretary............... Peter Elliott
European Representative..........Jaap Visser
Publications Officer.............. David Apps
Information Officer...... D Crawforth-Hitchins
Trustee....................... Ken Govier*

For membership information contact
John Knights, johnsknights@btinternet.com

Editor: Jan H. Berning, **Tel** 815.895.6328 Fax 815.895.6328 JHBerning@comcast.net
Associate Editor: Charley Amsbaugh **Tel** 443.952.7681 research.eggscales@comcast.net
Associate Editor: Diana Crawforth-Hitchins **Tel** 01865.763096 lehitchins@gmail.com

Article submissions are preferred in MS Word with Times New Roman Font size 12.
Photos are best in 300 DPI Jpegs in a separate file with a maximum of 3 photos per Email.

Spanish Coin Scale Boxes, Part 5

BY LUDWIG RAMACHER & FRANCISCO VALLÉS

The first four parts described coin scale boxes from Valencia, Catalonia, Andalusia and Castilia-Leon, which all showed different shapes and features seen regionally. The boxes we want to discuss in this article all seem to be from the 19th century and do not show these differences.

Two principally different types, one covered by thin leather and one cut from wood, will be shown. Are they of Spanish origin, or are they imported and if yes from where?

Boxes covered with leather

One of us first saw these boxes from Spain, (*Figure 1 right)*, covered with thin red or black leather, when purchasing a collection of about 20 Spanish boxes several years ago. There was no reason to doubt that they had been made in Spain.

Afterwards, we found boxes with a similar shape produced in Milano (Lombardia) and Berlin (Prussia). Are there any connections between these three types?

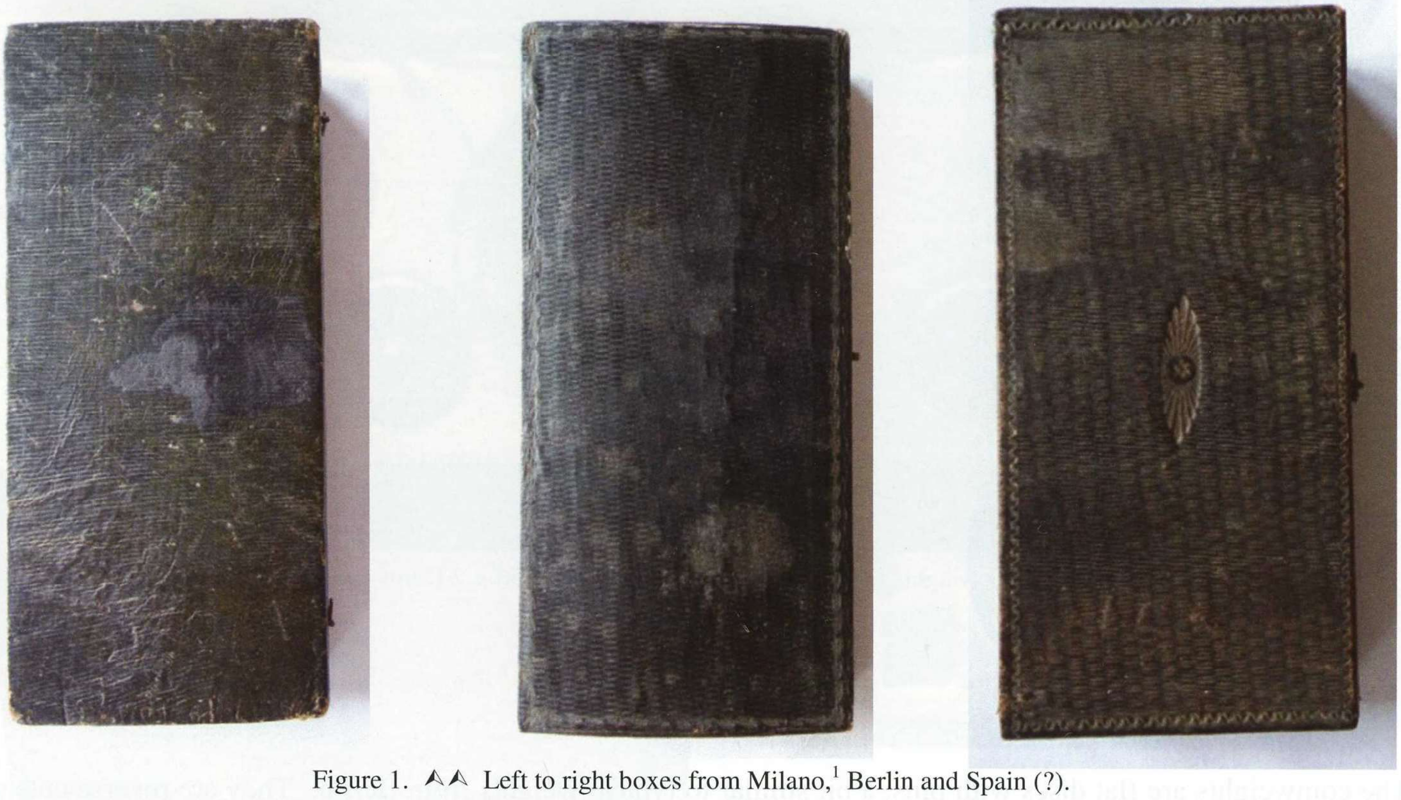


Figure 1. ▲▲ Left to right boxes from Milano,[1] Berlin and Spain (?).

The "Spanish" boxes are made from pale wood, the top and all edges are covered by leather, while the bottom is covered by paper. They are closed by one hook in the middle of the front. There are right as well as left handed hooks, simple or more elaborate ones. Inside, the boxes are covered by chamois or deer leather. They have indentations for the coin weights, and the space for the small balance, with both pans in a central position. The pans have rolled edges. The boxes all have similar but not equal sizes[2].

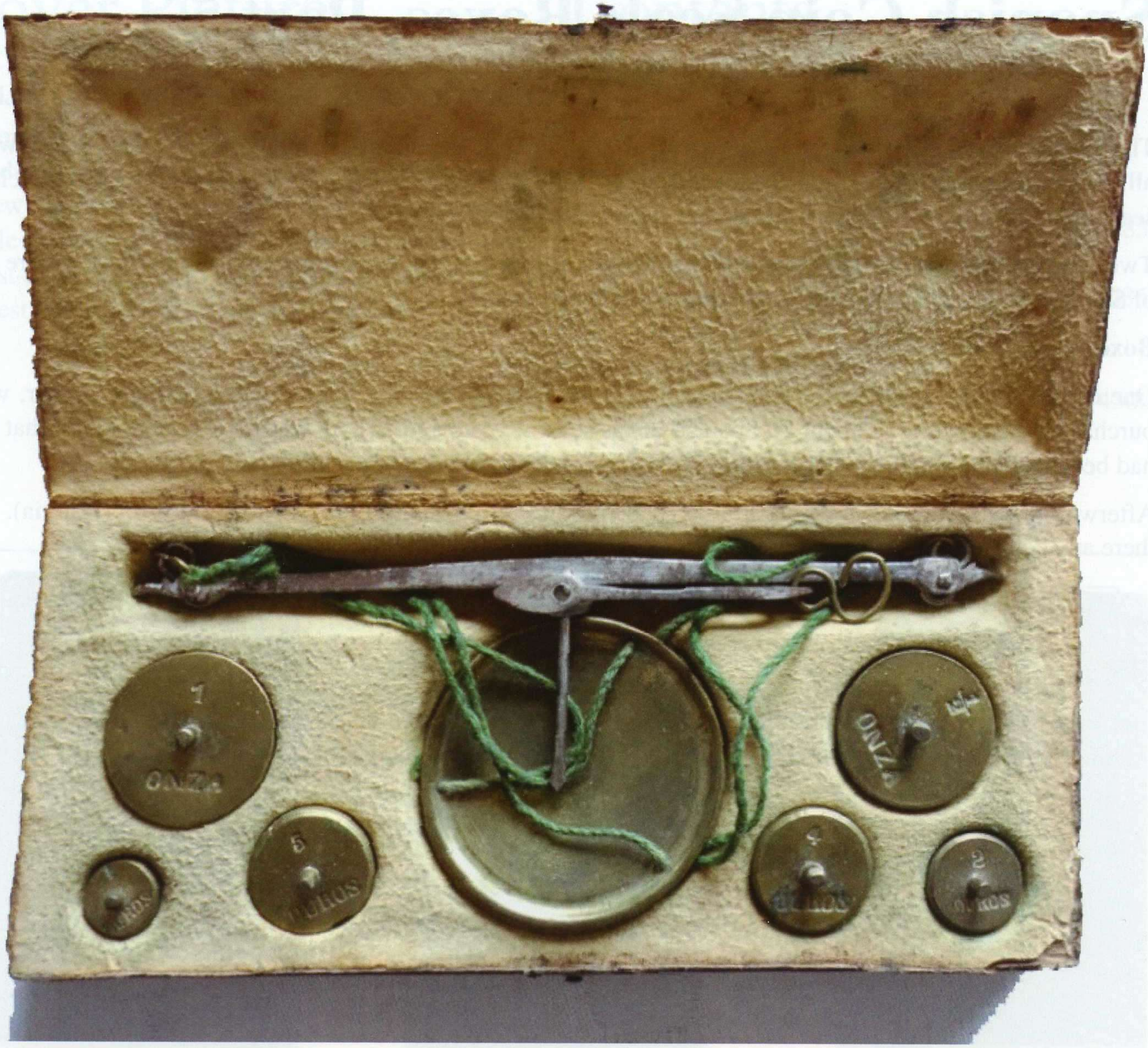


Figure 2. ▲▲ Box with coinweights for 1 Onza, ½ Onza, 5 Duros, 4 Duros, 2 Duros and 1 Duro.

The coinweights are flat discs with pins, a bit similar to typical weights from Berlin. They are reverse cuts of coins in this case. Besides this type, which seems the most common, there are three different ones, as shown in figure 3. The beams can be steel[3] or brass. The ending of the beam made in brass looks similar to those from Berlin, while those made from steel have endings of the type typically found in Nürnberg. Due to the fact that most (not all) boxes contain a weight for the five Duro coin, it is clear that they are made after 1854, when this coin was first struck under Isabella II.

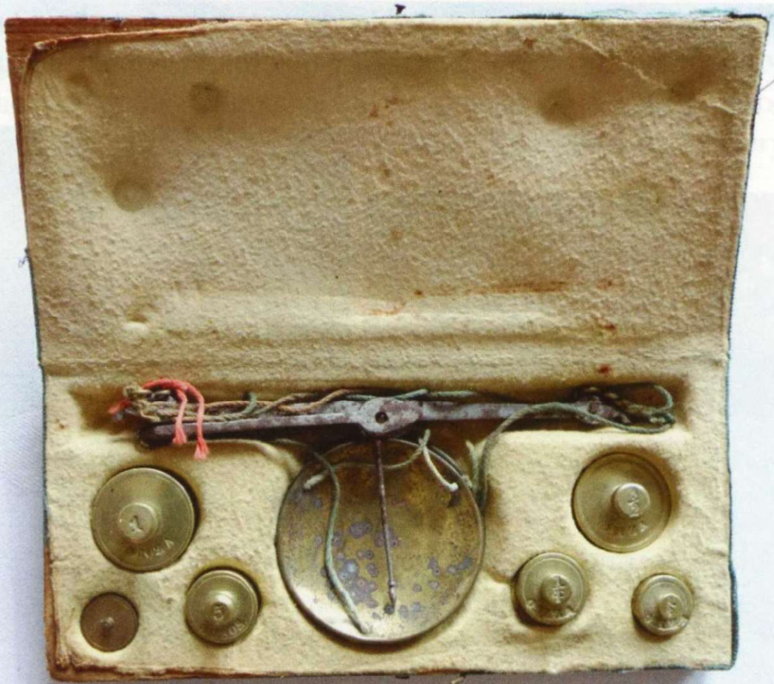
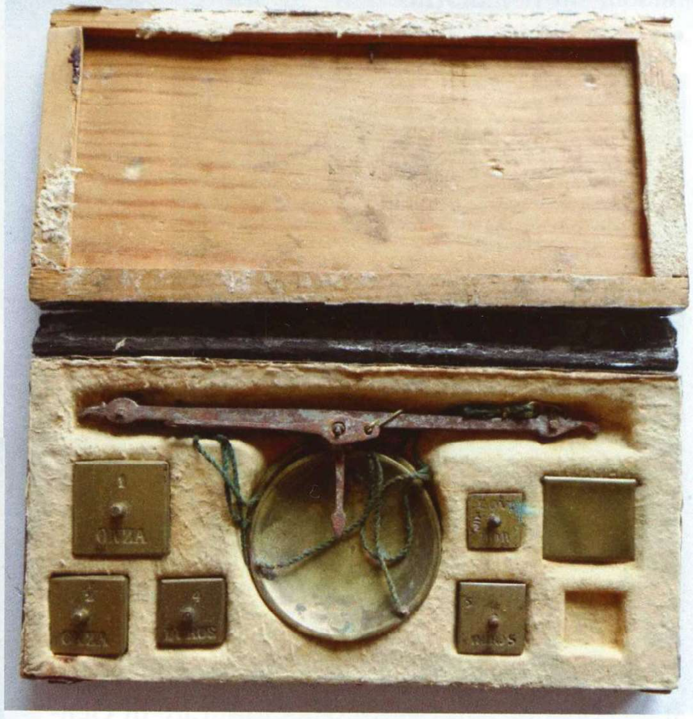
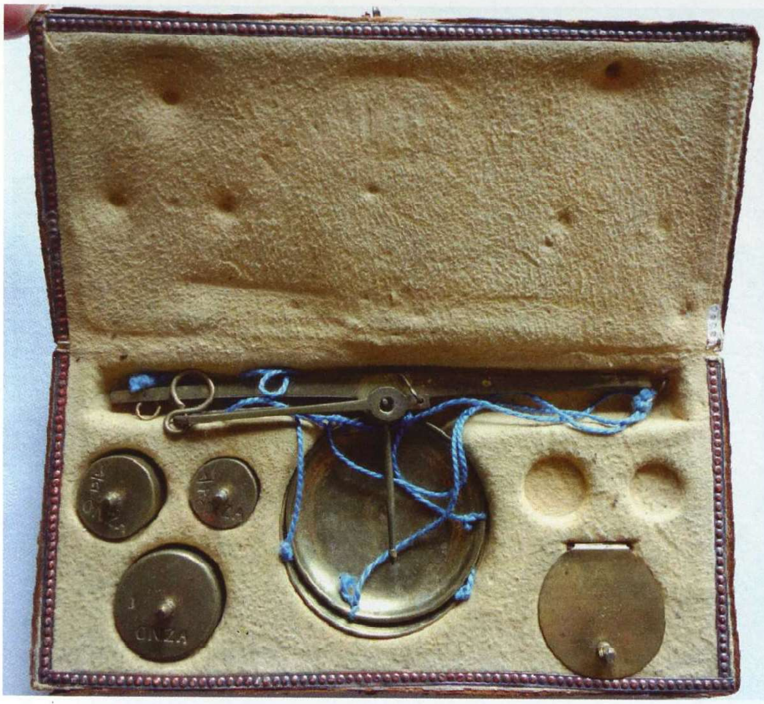


Figure 3a ▲ , 3b ► , & 3c ▼ Three types of boxes with different shapes of weights.





Nearly all of the boxes show a symbol in the middle of the cover, three different symbols have been found so far (figure 4). The symbol on the right is the one most common. There is evidence of a fourth symbol, but the photos are not usable. About 2/3 of the boxes are black, 1/3 are red.

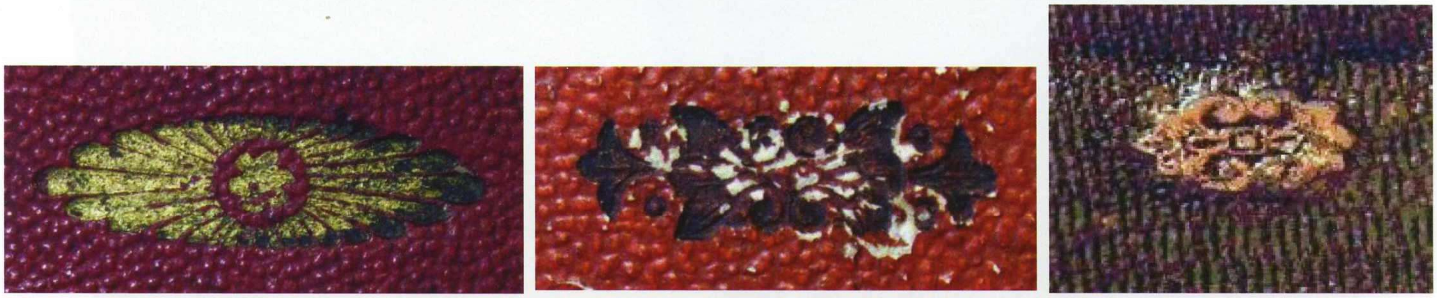


Figure 4. ▲▲ Symbols on the cover.

We did not find any proof that makers from Berlin have exported boxes to foreign countries, nor are the boxes similar enough.

- There are no rolled edges of pans with balances from Berlin.
- The pans in the boxes from Berlin are typically in indentations on the left and right side of the box.
- The endings of the brass beams are similar but not identical. (see *figure 5*).

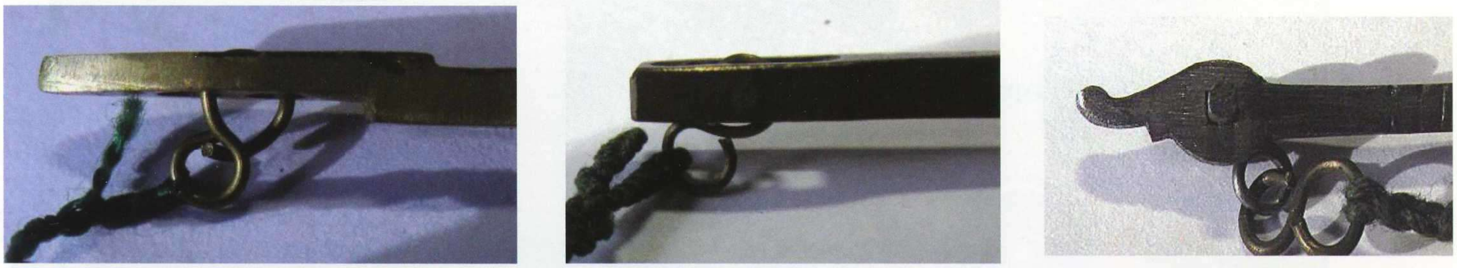


Figure 5. ▲▲ Beam ends: Left-Berlin type (brass), Center-Spanish Box (brass), Right-Spanish box (steel.

Finally the best indication to help find the origin of these boxes came from other boxes. In collections and literature there is proof of quite similar boxes made for the Italian and Portuguese[4] market. The boxes are exactly the same type, the type of weights is equal, just the content is made for the different market. The box made for Italy contains two coinweights for "Lire di Genua" and the way of writing quite clearly indicates a German origin of the box.

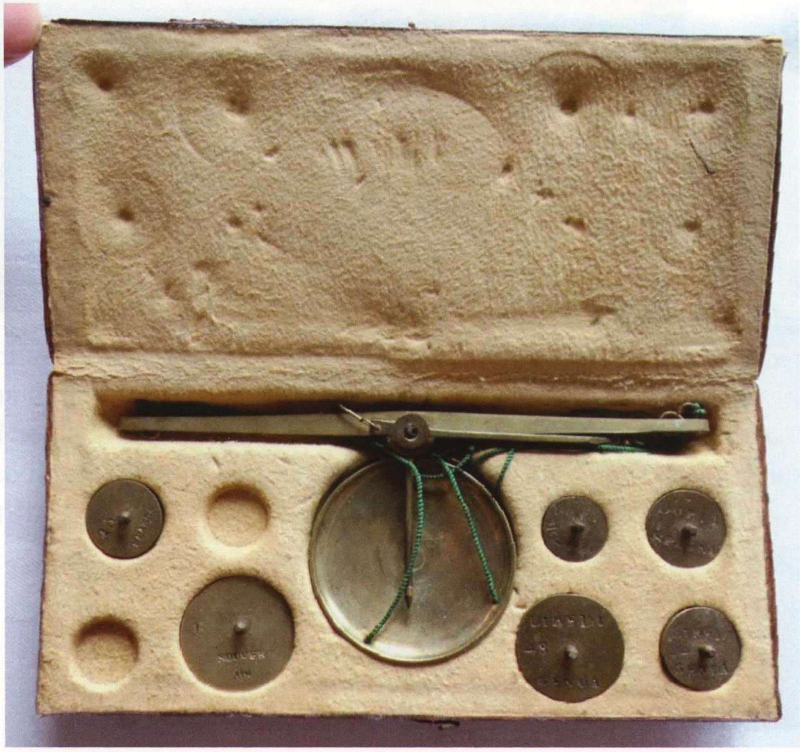


Figure 6. ➢➢ Box with six coinweights remaining, for coin circulating in Italy.

The symbols on the cover should represent different makers. As the boxes seem to be from Germany, the most logical solution would be that they come from Nürnberg. None of the features of the boxes would contradict that assumption. Nürnberg was famous for trading all kinds of nested weights and coinscale boxes throughout Europe. Actually we know a few dozen Spanish cases, but very few for Italy and Portugal.

Wooden boxes

For the second type of boxes, it seems to be easier to connect them with Nürnberg, as they look immediately similar to such well known ones from there. But is that right?

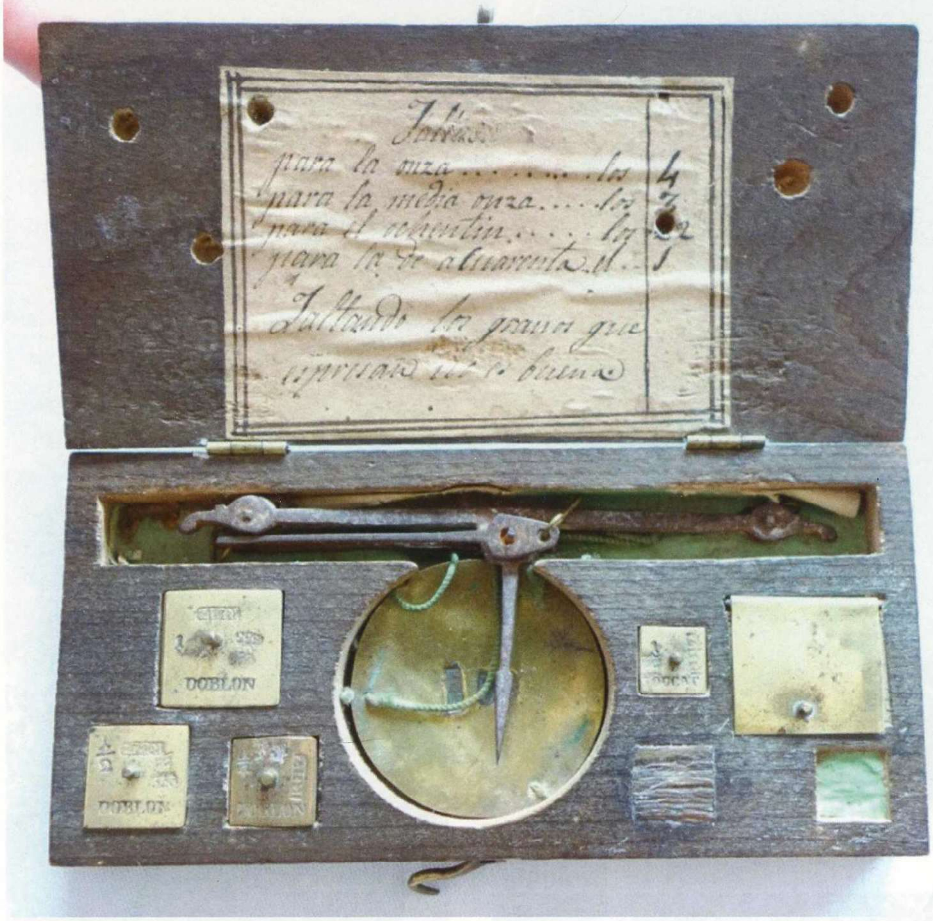

para la onza .... las 4
para la media onza .... las 3
para el ochentin ..... las 2
para la de a cuarenta ... 1
Faltando los granos que
DOBLON
DOBLON

Figure 7. ⮝⮝ Box with marks of Ruiz from Burgos, Spain

Figure 7 shows a helpful case, as the verification marks allow an assignment in time and to a city. The bearded king [mark on the weights] is the town mark of Burgos and RUIZ is for Juan Ruiz[5], a local verifier, proven for 1829. It is actually the only box of that type we are aware of having a label[6] remaining, describing how to use it. It is different from labels we know from other regions as this one looks handwritten and not printed.

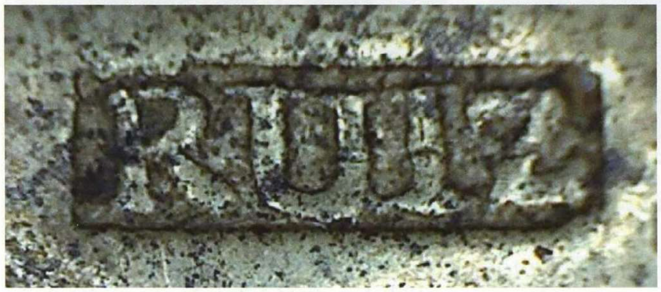
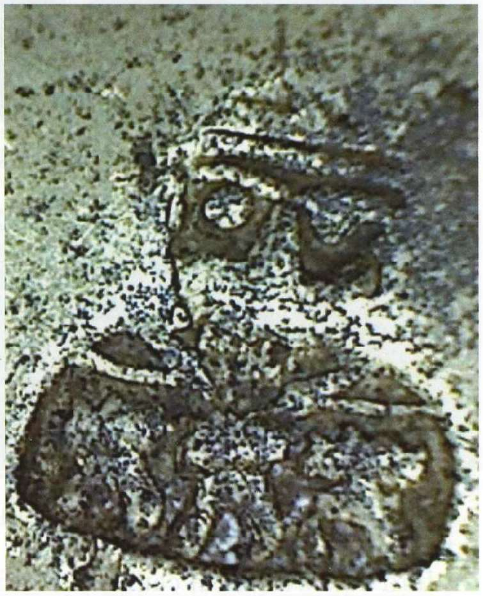


Figure 8. ⮜⮞ The marks of RUIZ and the city of Burgos.



The Typical features of such boxes are:

- Central space for the two pans of the balance
- Nearly always three holders for coinweights on the left side (just one case with four holders known)
- A holder with cover for the fractional weights and two or three holders for coinweights on the right side.
- The coinweights always have a pin and are reversed truncated pyramids.
- The beam endings are the type of figure 5 right, which is clearly Nuremberg.

The boxes are wood stained dark, but there are also unstained versions. The size of all boxes known by us is again similar.

A second box allows again an assignment in time.

The two remaining coin weights show the town mark of Bilbao and the mark LOIZAGA. That should be the verifier and goldsmith Marianno de Loizago known between 1831 and 1852[7]. Besides these two names, also the fact that these boxes very rarely have a coinweight for the 5 Duro coin, which was minted after 1854, and helps to assign them mainly to the first half of 19th century.

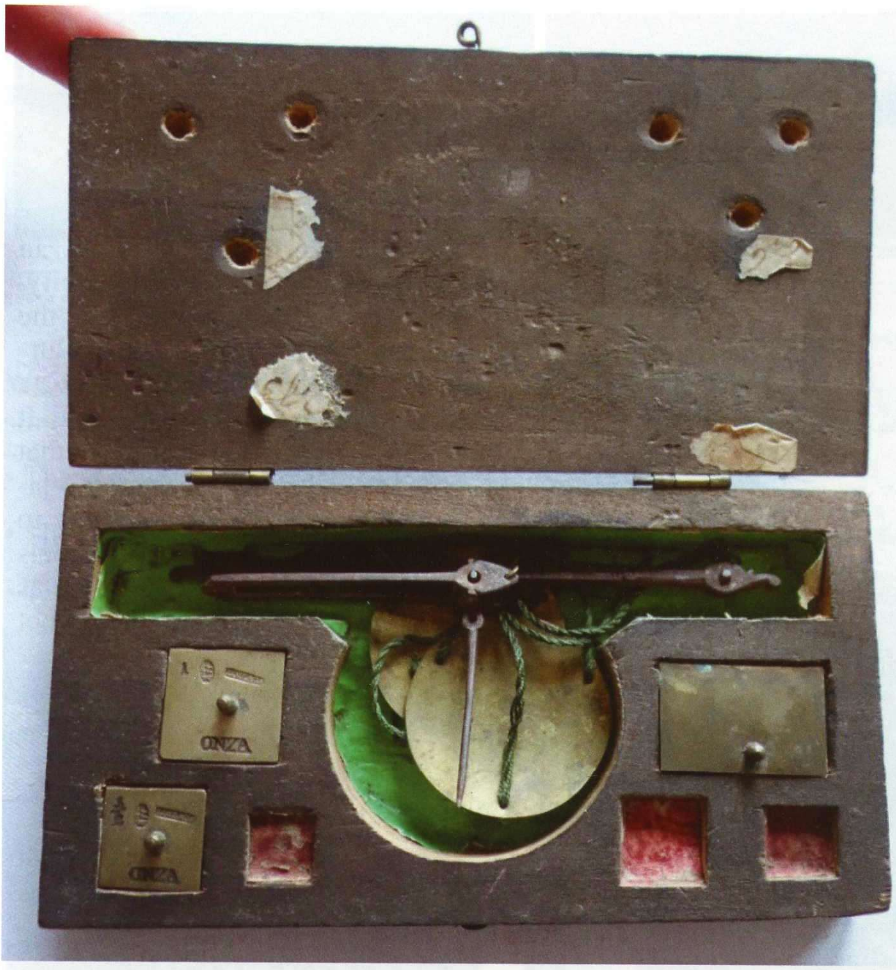
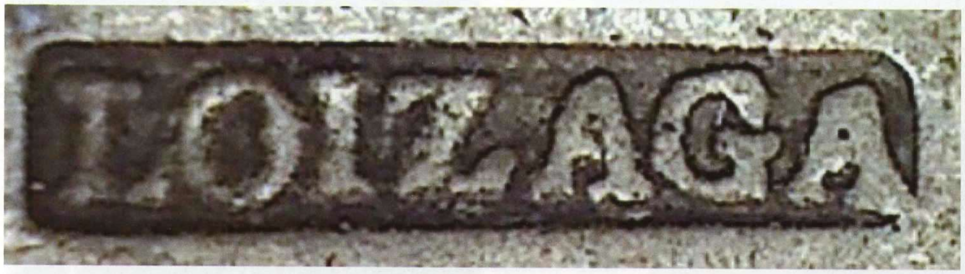


Figure 9. ▲▲ Box with marks of Loizaga from Bilbao.



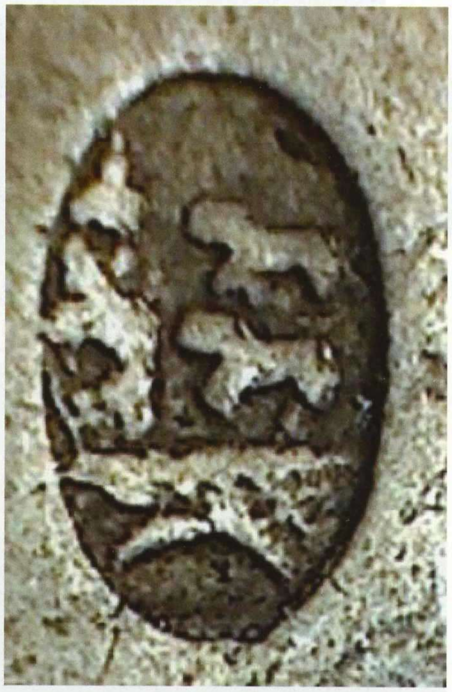


Figure 10. ▲➤ Details of the marks of LOIZAGA and Bilbao.

A third box with label can be found in *Enciclopedia De La Plata Espanola y Virreinal Americana*; Fernandez, Munoa, Rabasco, Madrid, 1985 on p.34, indicating Joan Vincente de Sasa, goldsmith from Pamplona as verifier. His known working period is 1816-1836.

Two different types of closures can be found, one hook at the front (several types left – and right handed) and a closure through the lid.

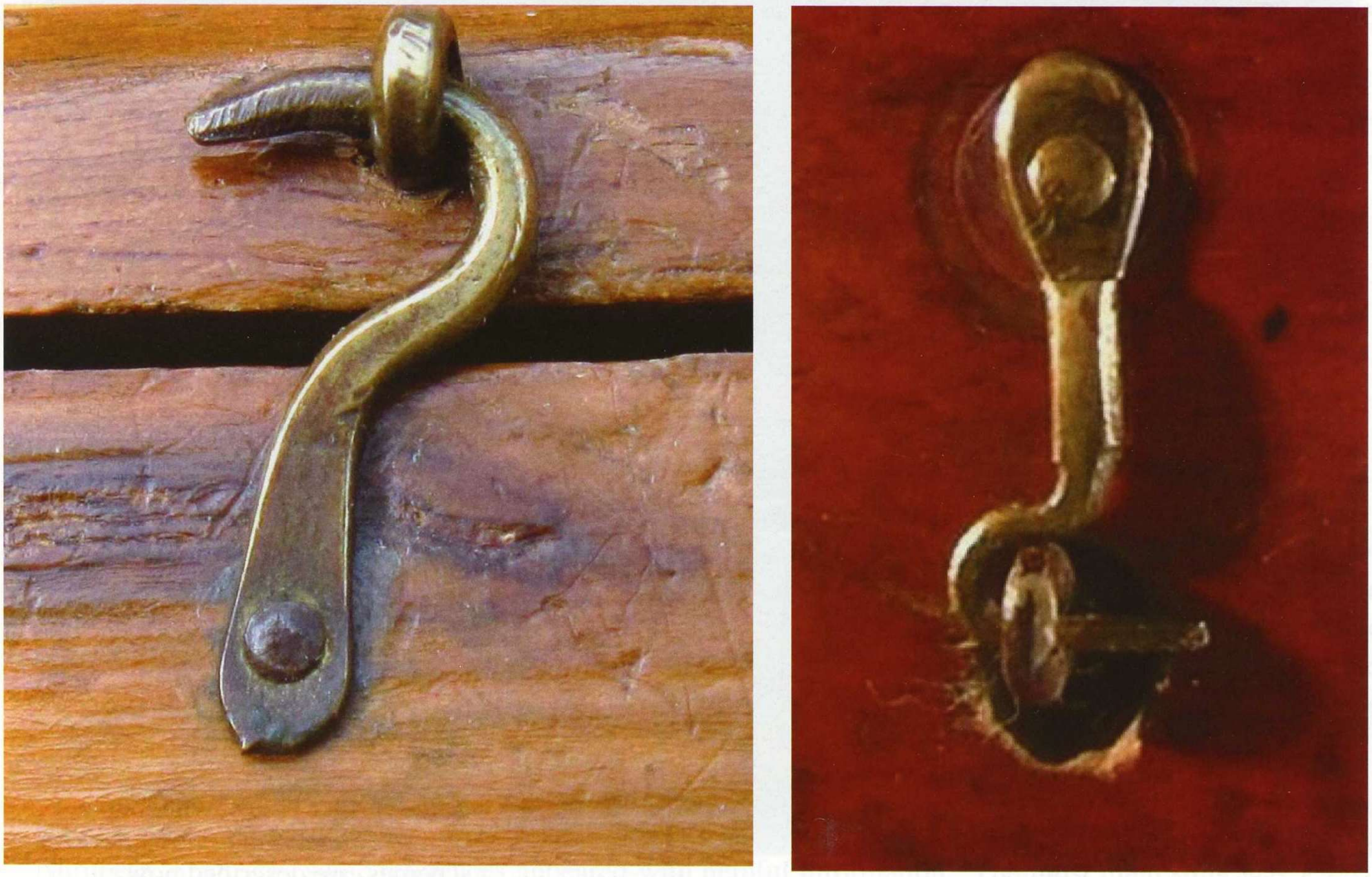
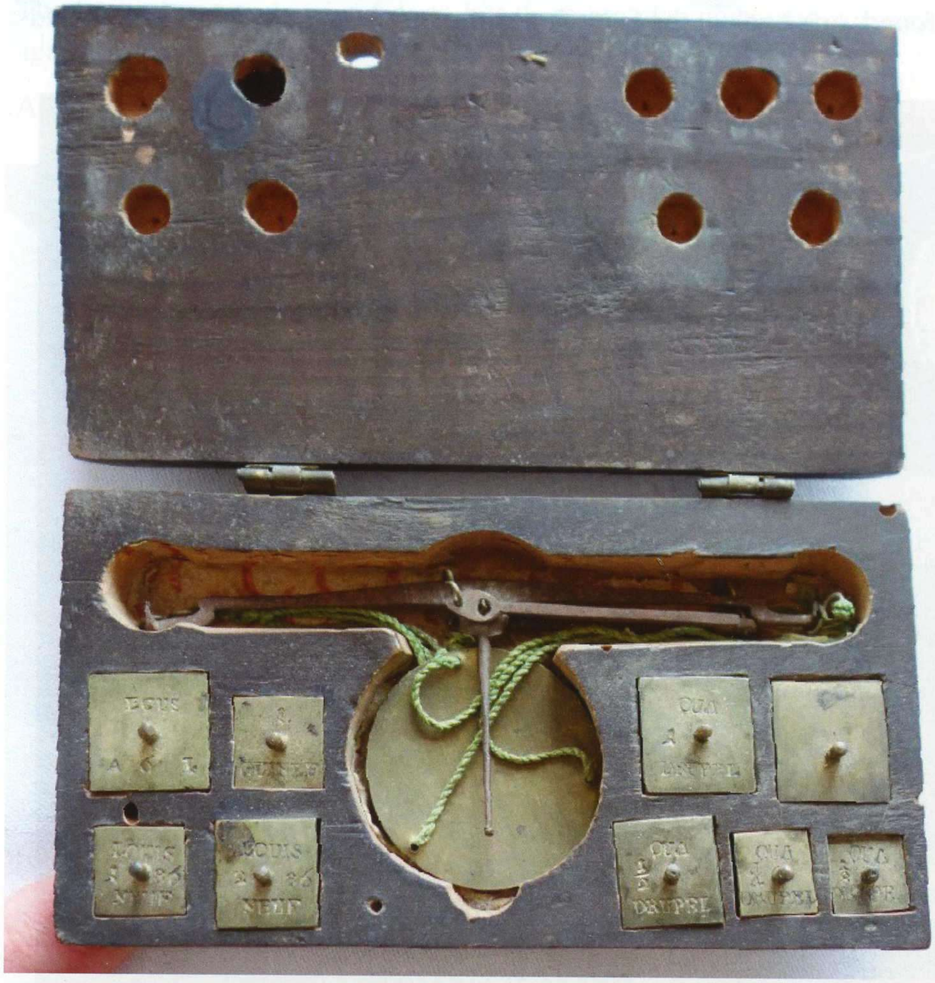


Figure 11. ▲▲ Types of hooks.

The inscription on the weights looks surprisingly diverse[8]. The name generally used is either Onza or Doblon, both typical but not necessarily the official names of the currency in use. The term Duron started to be used only after 1850. But even Coinweights for Ducat have been used, a coin very much older than the 19th century. Table 1 shows some examples.

Table 1: Combination of coin weights in the different boxes

Mass (g)						
27,06	1 Onza	1 Doblon	1 Doblon	1 Onza	1 Onza	1 Doblon
13,53	½ Onza	½ Doblon	½ Onza	½ Onza	½ Onza	½ Doblon
8,5				5 Duros	5 Duros	5 Duros
6,76	¼ Onza	¼ Doblon	¼ Onza	4 Duros	¼ Onza	¼ Doblon
3,5		1 Ducat	1 Ducat/1Ducat			
3,38	1/8 Onza	1/8 Doblon		1/8 Doblon/ 2 Duro	1/8 Onza	1/8 Doblon
1,69	1/16 Onza	1/16 Doblon				1/16 Doblon



It seems useful to compare these boxes with one definitively made in Nürnberg, as it shows a master mark from there. The coinweights are prepared for Spanish and French coins of that time. The timing of the box is simple, as the working period of the maker is known to be after 1773/74 and it has a dated coin weight (Louis Neuf, 1786). Similarities are obvious, though details are different. Not too surprising due to the few decades between the different boxes. Inscriptions are all in French.

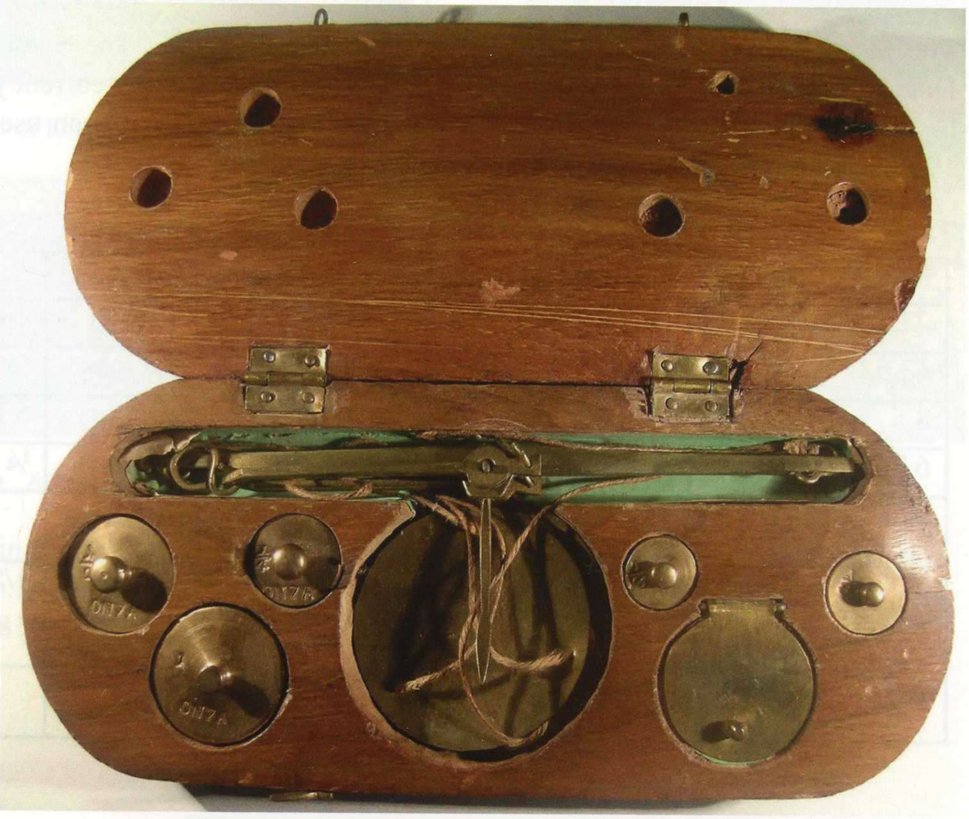
Figure 12. ≺≺ Box made by Johann Gabriel Sigler.

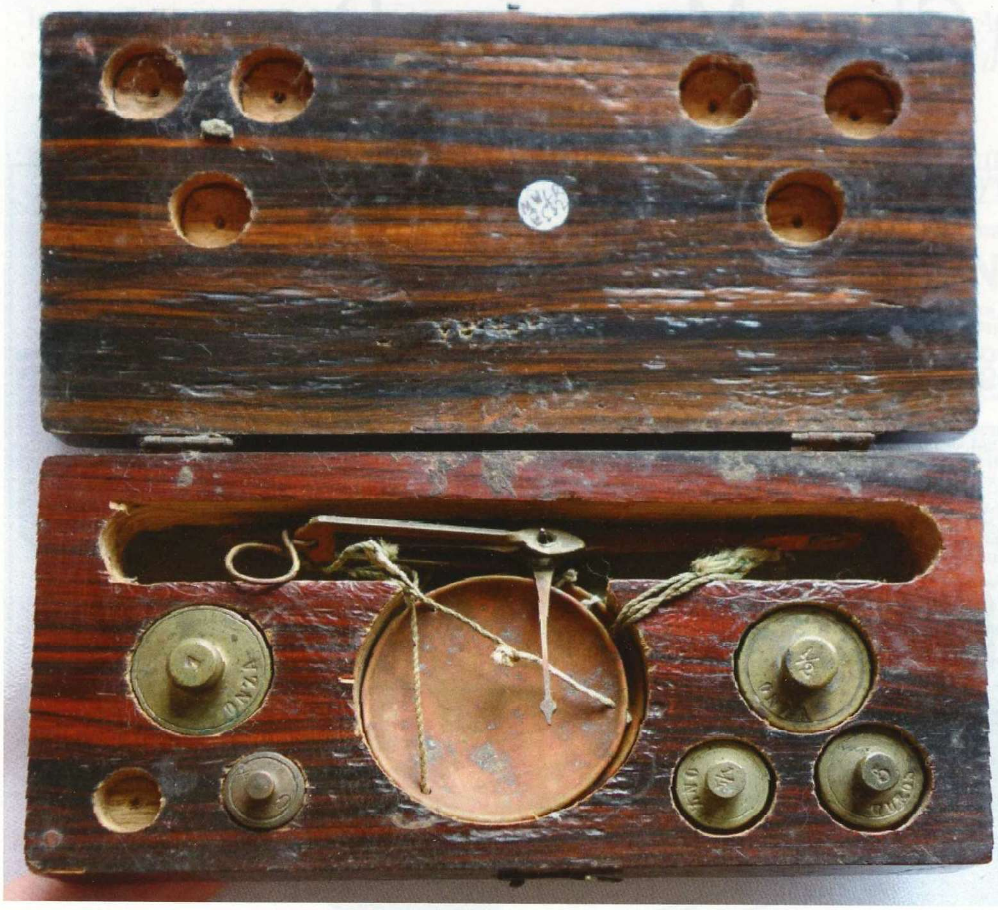
The options are clear:
a) boxes are from Nürnberg and were exported to Spain.
b) the boxes are copies of those from Nürnberg.
c) both a) and b) are true

Some further boxes, which do not fit immediately into one of the two schemes, are described now.

Figure 13. ≻≻ An oval box cut from wood.

This box (figure 13) should be from the first half of the 19th century, as it is without the coinweight for 5 Duros. While the box shown in figure 14 has such a weight and is therefore after 1854. Weights, balance and the round cover for fractional weights are quite similar to the box of figure 3. This box should therefore also be from Nürnberg.





Regarding the last box, we are not sure whether this type is also made in Nürnberg or perhaps in Spain. It seems to be made from plywood with painted veneer structure. Balance and coinweights are similar to one type shown in figure 3.

Figure 14. ⋞⋞ Plywood box.

Conclusion

The three different types of boxes with thin leather are surely not derived from one common production area. Did one of the examples influence the others? Possible.

Finally with the support of Google Books we could bring some further light into the darkness. Simply using the terms "Goldwaage, Nürnberg, Spanisch" some references appeared with helpful information. The most interesting was *Kunst- und Gewerbeblatt der Polytechnischen Vereine für das Königreich Bayern*" dated 1867. In there is an interesting article *Die Rot- und Gelbgießerei*[9] *in Nürnberg*, including the situation of the balance and weight makers. Even names were listed, with Georg Bach (Johannesgasse) and Johannes Zophy (Beckschlagergasse). For both it is explicitly mentioned that they are specialized on Spanish gold-balances. For two further masters (J. Braun, Beckschlagergasse and Conrad Sichler, Sterngasse) export is described to America, Australia and Russia. Spain is not especially mentioned for these two. Some names are well known, the father of Georg Bach is listed in Lockner and the name Sichler is also represented back in the 18th century. Therefore, it seems obvious that these families did similar exports also in the first half of the 19th century and probably before.

References

1. The similarity here is obviously only formal, as the coinweights are monetiform. The boxes are produced in Lombardy, most if not all in Milano. The balances are made from brass, a type similar but not equal again to those of boxes from Berlin or the "Spanish" ones.
2. The size can be found between 14 -14,5 x 6,2 -7 cm, and a height of 2,5 cm.
3. Balances made from steel are in majority, balances made from brass in addition are found till now only in boxes with the left symbol shown in figure 4.
4. Zavattoni, Guido. 2003. *Bilance e Strumenti per pesare le monete* (Metà XVII – XX Secolo) di una collezione privata. Campogalliono. S. 266
5. Altés, F., 1832. *Traite comparative des monnaies, poids et mesures, changes, banques et fonds* publiques entre la France, l' Espagne et L' Angleterre, Marseille.
6. *Ochentin* and *Cuarenta* were terms used for small gold coins under Isabella II.
7. *La orefebria neoclassica de Biscaya…*, 2002
8. One has to be aware, that there will be cases of replacements even in these boxes.
9. *Rot- und Gelbgiesser* are the profession working with copper, brass etc. This profession had a history in Nürnberg back to 14th century and perhaps earlier.

The Ketchum Glove Measuring Device

BY DON SCHOENLY

The little device in Figure 1 from the US Patent Application 933,992 is a Ketchum Hand Measure. It was patented September 14th, 1909 by W. N. Ketchum as a glove measuring device.

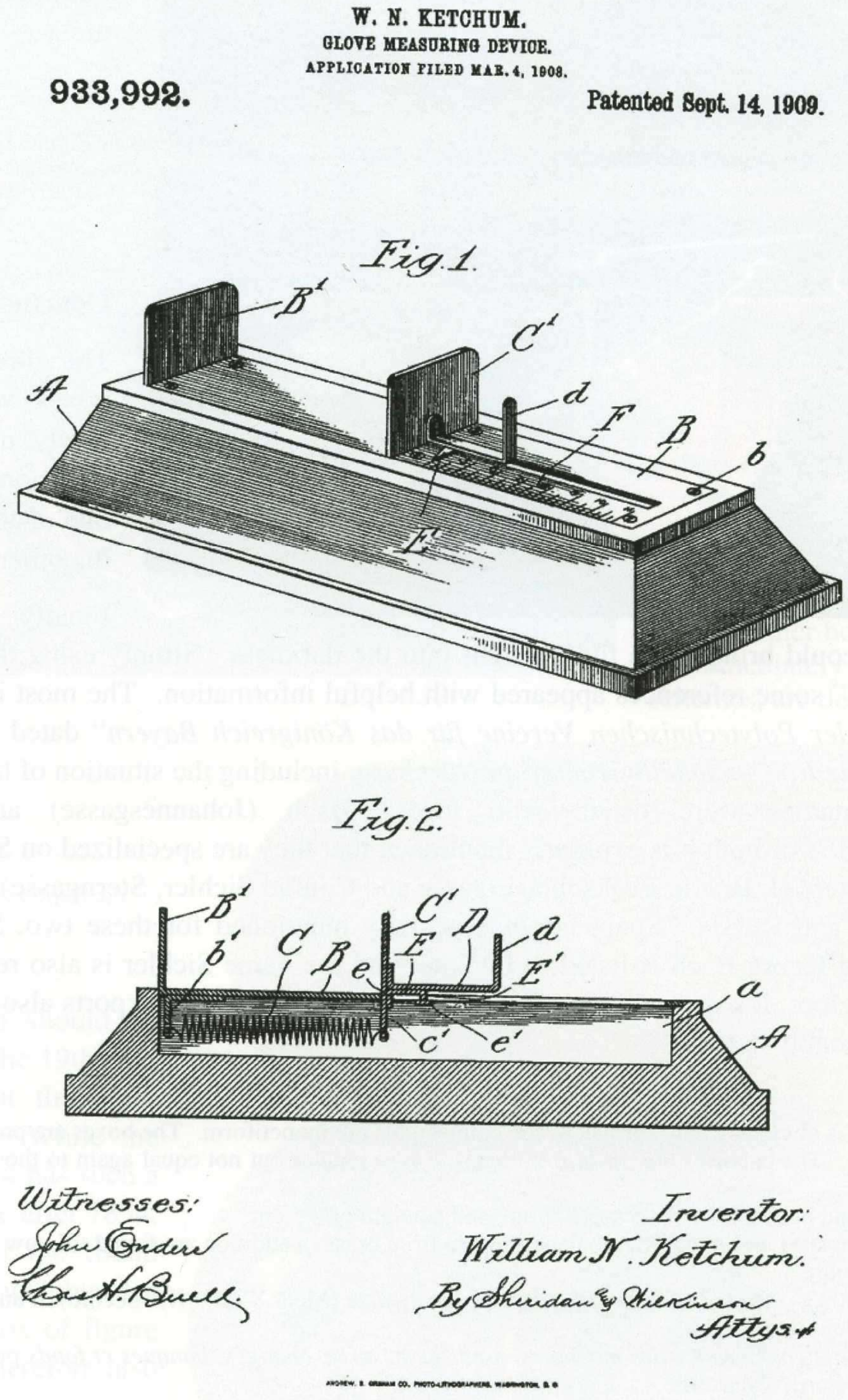
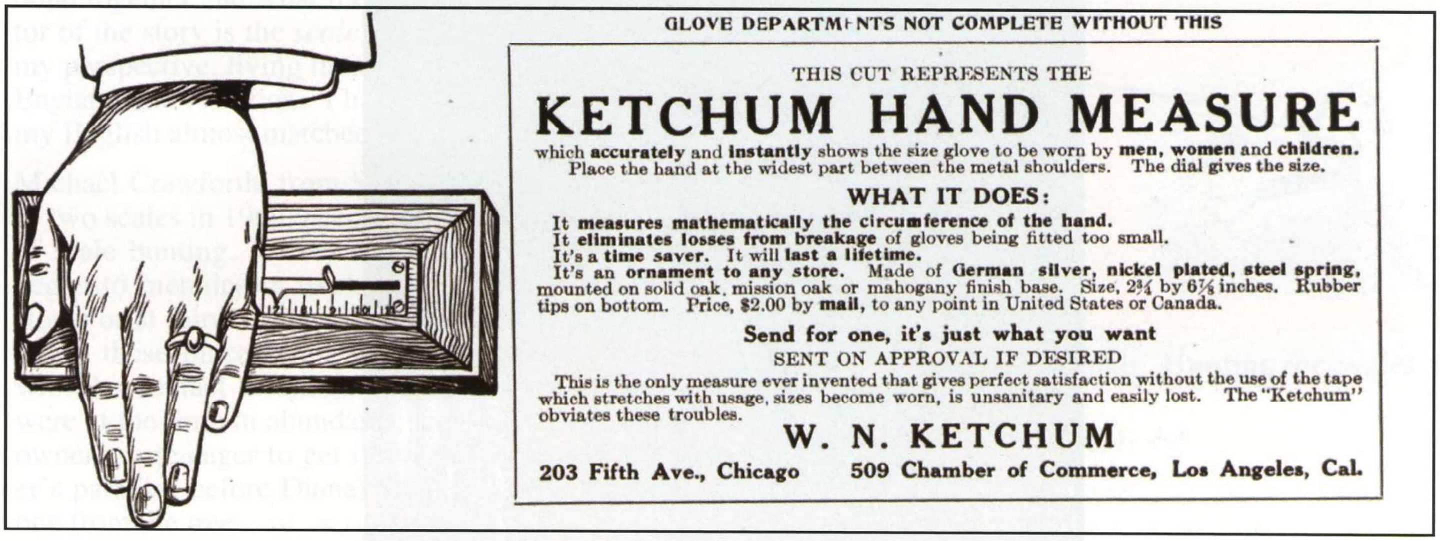


Figure 1. ∧∧ **US Patent Number 933,992.**

In an Advertisement in *The Clothier and Furnisher* for this device it says *Accurately and instantly shows the size glove to be worn by men, women and children. Place the hand on the widest part between the metal shoulders. The dial gives the size.*



GLOVE DEPARTMENTS NOT COMPLETE WITHOUT THIS

THIS CUT REPRESENTS THE

KETCHUM HAND MEASURE

which **accurately** and **instantly** shows the size glove to be worn by **men, women** and **children.** Place the hand at the widest part between the metal shoulders. The dial gives the size.

WHAT IT DOES:

It **measures mathematically the circumference of the hand.**
It **eliminates losses from breakage** of gloves being fitted too small.
It's a **time saver.** It will **last a lifetime.**
It's an **ornament to any store.** Made of **German silver, nickel plated, steel spring,** mounted on solid oak, mission oak or mahogany finish base. Size, 2¾ by 6⅞ inches. Rubber tips on bottom. Price, $2.00 by **mail,** to any point in United States or Canada.

Send for one, it's just what you want

SENT ON APPROVAL IF DESIRED

This is the only measure ever invented that gives perfect satisfaction without the use of the tape which stretches with usage, sizes become worn, is unsanitary and easily lost. The "Ketchum" obviates these troubles.

W. N. KETCHUM

203 Fifth Ave., Chicago **509 Chamber of Commerce, Los Angeles, Cal.**

Figure 2. ▲▲ *The Clothier and Furnisher*, February 1909, p 114.

A contemporary advertisement in *Drygoods Reporter* goes on to say that it can be ordered directly from W. N. Ketchum from their Chicago or Los Angeles offices or from Marshall Fields and Co.

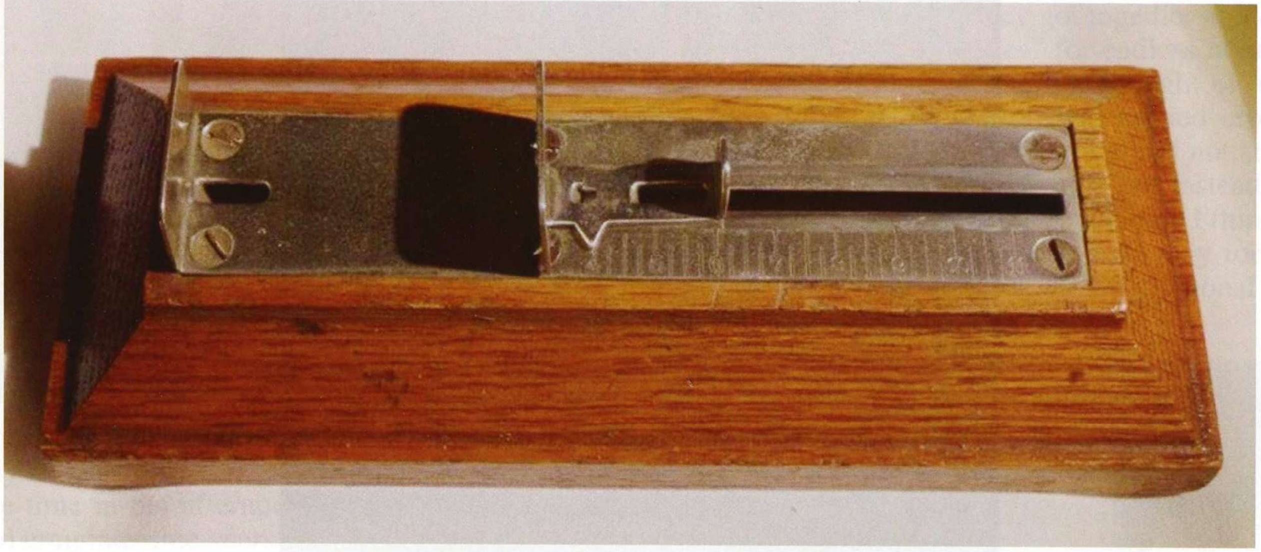
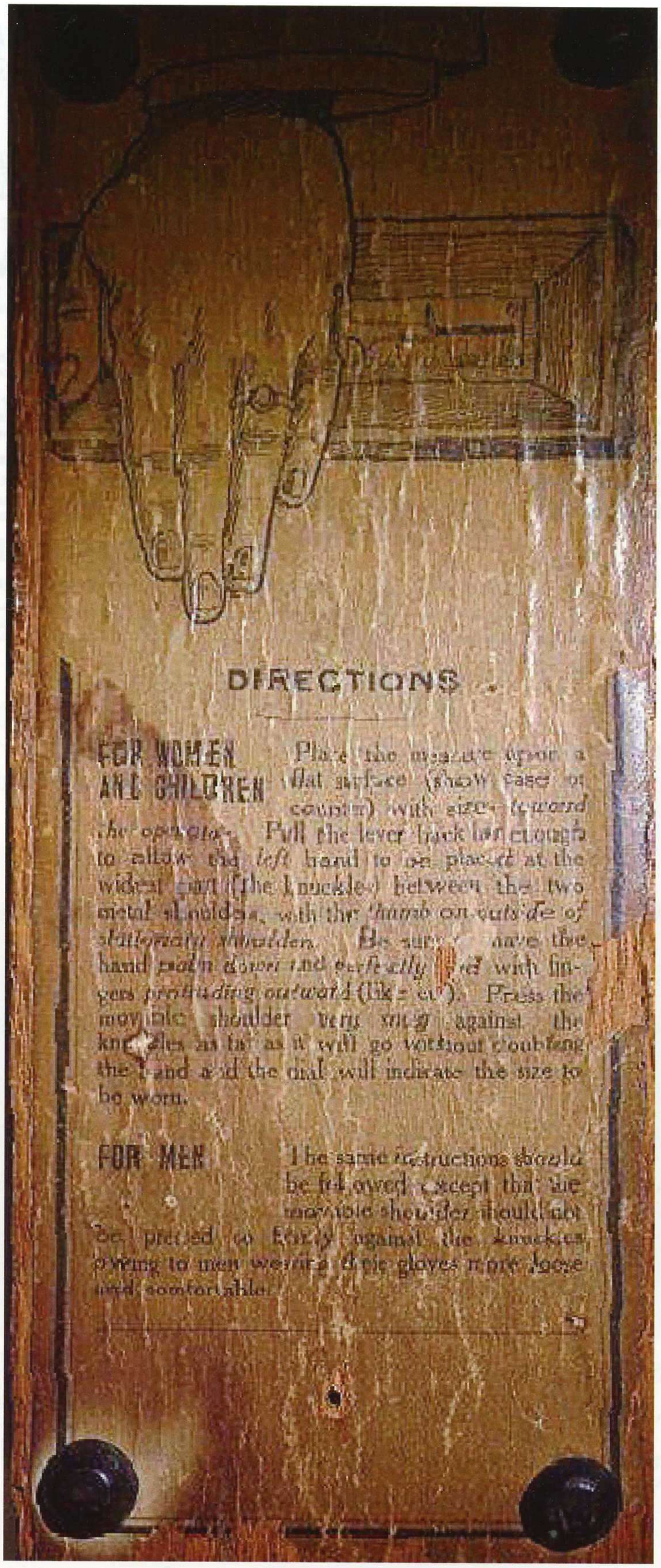


Figure 3. ▲▲ The Ketchum Hand Measure.

The base of the hand measure is oak and the metal is Nickel over Brass. The metal has stamped on it "Patent Applied For" and has glove measurements from size 4 through 11 with 4 increments between each number,

On the bottom, Figure 4, is a label telling a clerk exactly how to use this device with a picture. There are different directions for men versus women and children. The reason for the difference is explained that men wear their gloves more loosely and comfortably.



DIRECTIONS

FOR WOMEN AND CHILDREN Place the measure upon a flat surface (show case or counter) with sizes toward the operator. Pull the lever back far enough to allow the *left* hand to be placed at the widest part (the knuckles) between the two metal shoulders, with the *thumb on outside of stationary shoulder.* Be sure to have the hand *palm down and perfectly flat* with fingers *protruding outward* (like cut). Press the movable shoulder *very snug* against the knuckles as far as it will go without doubling the hand and the dial will indicate the size to be worn.

FOR MEN The same instructions should be followed except that the movable shoulder should not be pressed so *firmly* against the knuckles, owing to men wearing their gloves more loose and comfortable.

Figure 4. ⮝⮝ Directions on the bottom of the Ketchum Hand Measure.

The Spirit of ISASC's Founders

BY UTZ SCHMIDT

Spirit of the - ISASC - Founders
Our common Goal: Hunting for Scales

Fig. 1.

You might wonder what drove the early ISASC members to bond together and what their goals were (Fig. 1). The narrator of the story is the *scale crazy Utz* from Germany. This is my perspective, living then far away from the main action in England and America. I had no knowledge about scales and my English almost matched this level of expertise.

Michael Crawforth, from Sunderland, England, proud owner of two scales in 1969, needed a while to succumb to the fever of scale hunting. But then in the early '70s, he and Diana began to mercilessly track down any small scale in antique stores or at fairs of England. Later on they also started plastering these places with sheets of beautiful English scales, with the contact information at the bottom (Fig. 2). Scales were at the time in abundance and worth just pennies. Store owners were eager to get rid of them – creating a scale buyer's paradise before Diana, Michael's wife, plucked the first one from the tree.

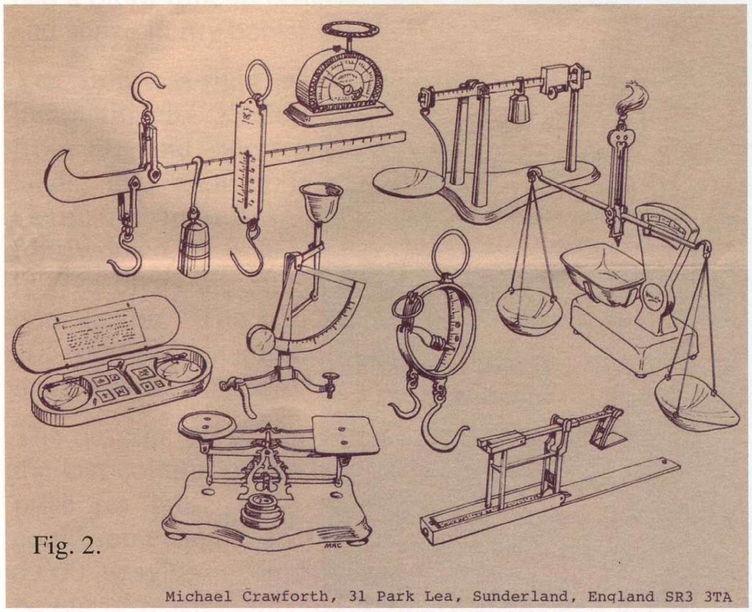


Fig. 2.

Michael Crawforth, 31 Park Lea, Sunderland, England SR3 3TA

Another predator, Bob Stein, from Chicago – everything is bigger in America – had written a story on scales for an antique collectors' magazine, which caught the eye of Michael Crawforth. They started to correspond with enthusiasts, using drawings, as collectors had little or no vocabulary to explain parts or functions. One day they got together at the Crawforth home, talking "scales" for endless hours in the living room and solidifying the thought of a collectors' society, a dream Bob had carried around for quite a while. Margie, Bob's wife, did not at all participate in the lively discussions but instead knitted and embroidered, according to Diana – I think it was very kind of her, caring in her own way for the expected brain child, ISASC, the International Society of Antique Scale Collectors.

Meanwhile, to improve my English for the future, I spent July 1976 with my family in Hastings, England, with all of us taking classes in the morning and ample time in the afternoon to explore the area. I had no inkling then that I would emigrate nine years later to Michigan. My first scale, bought in 1975, in a little mountain village of northern Italy, was really destined to hold a flower pot (Fig. 3). It never did. Like mice, it multiplied rapidly (must have been pregnant when I got it) and a fever overcame me during that England vacation in "scale heaven," filling the trunk of my car with scales, moving the luggage to the rear seat between my kids. Along the course I got trapped on Michael's fly-paper – I think that's how "flyers" came about. Back home in Wolfsburg, I forged a letter to "Dear Sir Michael" about the recent adventures and my intent to join the just forming "club of scale collectors" and my interest in purchasing his beautiful sketches. On the 18th of August Michael answered my letter, sending the sketches and asking to wait for a membership application form.

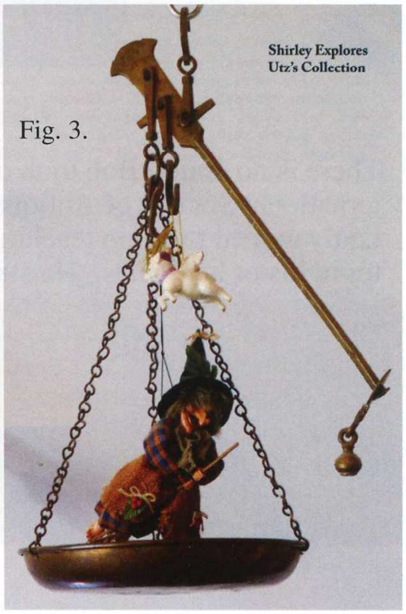
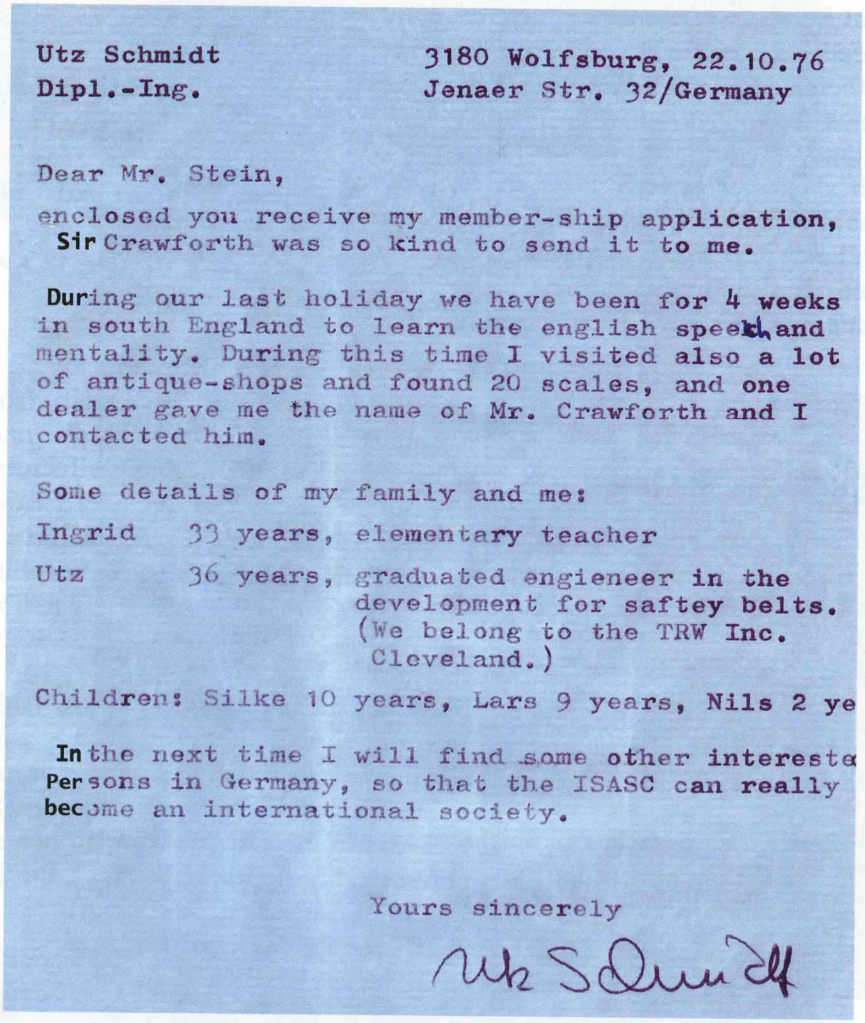


Fig. 3.

Shirley Explores Utz's Collection

Bob went on pestering Michael to start a society. Then, in September 1976, ISASC came to life with Michael's expertise, Bob's sense for business, and Diana's curiosity and drive, mixed with a good portion of scale enthusiasm of the three. Still wondering about the foundation of ISASC, I think Bob's remark in his January 1977 Newsletter is the answer: *As a matter of fact, when the history of ISASC is written, let it be noted that the first 'official' ISASC convention was held Saturday, September 25, 1976, at Durant's Hotel in London, following a morning at Portobello [Road market]. In attendance were the Crawforths, Rentons, Dennis Vorley, John Mussell, and the Steins.*

After quite a wait I received the application form and sent it out with – as I see it today – a quite amusing letter to Bob Stein, as you can see in the printed copy (Fig. 4). (PS. I still have the same German accent.)



Utz Schmidt
Dipl.-Ing.

3180 Wolfsburg, 22.10.76
Jenaer Str. 32/Germany

Dear Mr. Stein,

enclosed you receive my member-ship application, Sir Crawforth was so kind to send it to me.

During our last holiday we have been for 4 weeks in south England to learn the english speech and mentality. During this time I visited also a lot of antique-shops and found 20 scales, and one dealer gave me the name of Mr. Crawforth and I contacted him.

Some details of my family and me:

Ingrid 33 years, elementary teacher

Utz 36 years, graduated engieneer in the development for saftey belts. (We belong to the TRW Inc. Cleveland.)

Children: Silke 10 years, Lars 9 years, Nils 2 ye

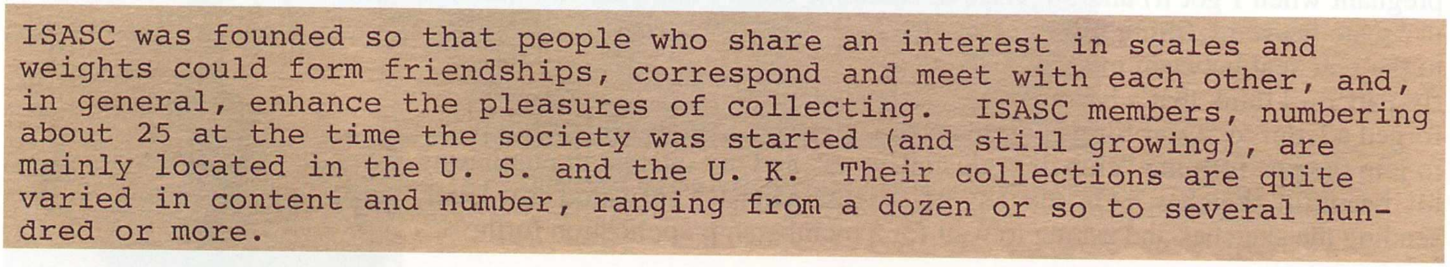
In the next time I will find some other intereste Persons in Germany, so that the ISASC can really become an international society.

Yours sincerely

Utz Schmidt

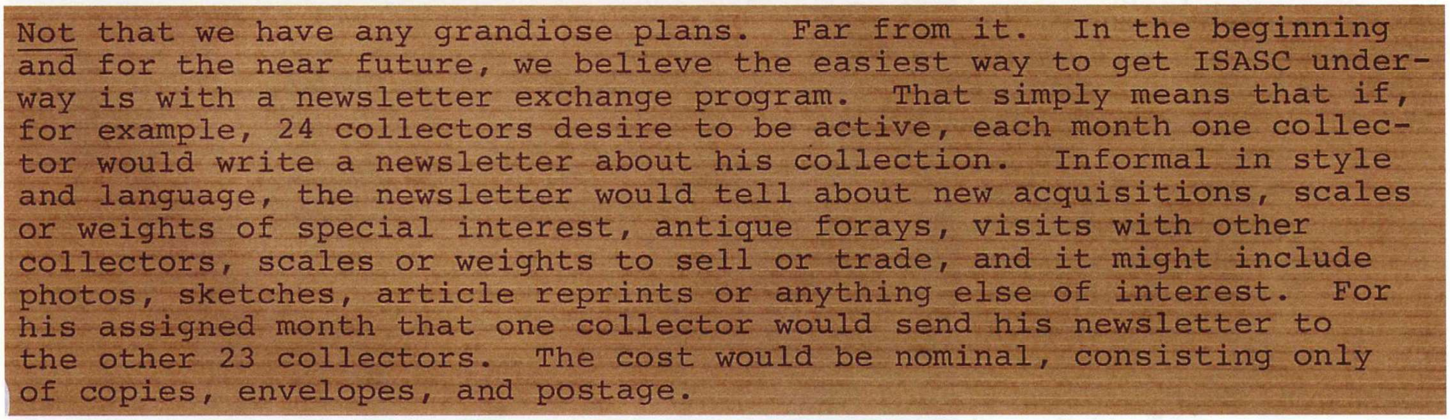
Fig. 4.

There is no doubt, Bob took over the business end and organization with an enormous drive to grow the International Society of Antique Scale Collectors. Bob promised to drum up members, while Michael hesitantly agreed to begin teaching. By January first of 1977, each of the 48 initial members had Bob's first letter in his or her hands. He stated the intent of the society as follows:



ISASC was founded so that people who share an interest in scales and weights could form friendships, correspond and meet with each other, and, in general, enhance the pleasures of collecting. ISASC members, numbering about 25 at the time the society was started (and still growing), are mainly located in the U. S. and the U. K. Their collections are quite varied in content and number, ranging from a dozen or so to several hundred or more.

That's all fine and dandy, but the eye opener is the statement in his very first communication (Fig. 5):



Not that we have any grandiose plans. Far from it. In the beginning and for the near future, we believe the easiest way to get ISASC underway is with a newsletter exchange program. That simply means that if, for example, 24 collectors desire to be active, each month one collector would write a newsletter about his collection. Informal in style and language, the newsletter would tell about new acquisitions, scales or weights of special interest, antique forays, visits with other collectors, scales or weights to sell or trade, and it might include photos, sketches, article reprints or anything else of interest. For his assigned month that one collector would send his newsletter to the other 23 collectors. The cost would be nominal, consisting only of copies, envelopes, and postage.

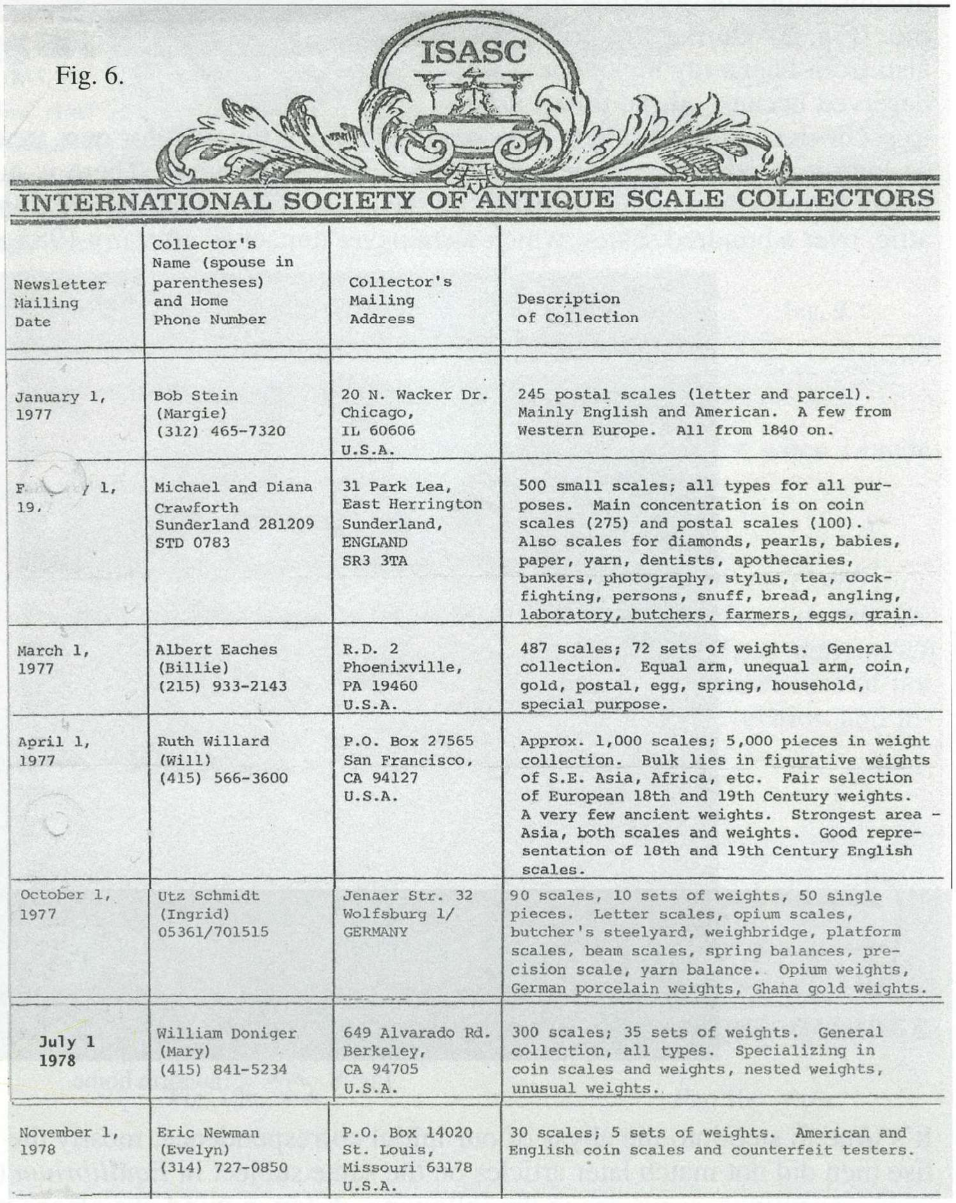
Fig. 5. AA Newsletter exchange.

It was accompanied by a complete listing of names and the dates for the member's turn to write something about scales. And so we did, one after the other, following the lead of Bob Stein and Michael, the second on the list. With my number 14, I had a bit of time to observe and learn and shake in my boots.

Yes, Bob was right, we were already international – 35 from the USA, 11 from England, one from the Netherlands, and another lost soul from Germany, myself. This included four women. It is sad to say that only five of us are still living, two in poor health. The good news is our 105-year-old champion, Eric Newman, is still going strong. (Fig. 6)

The description of the collections in the last column of the list was a surprise for me. How in the world could someone have 1,000 scales and 5,000 weights, even 500 seemed to be out of reach compared to my own 90 scales? (I think, I rounded the number off from 81 to impress) and weight sets – "set" sounded so much better than three or four weights which looked alike. Luckily there were other starters. The world of scales revealed itself more and more with each new letter. The importance of scales and their impact on our lives began to sink in. For me began a time when nothing had any significance outside my beloved job as an automotive engineer so I could get the needed money and scales.

Fig. 6.



ISASC

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

Newsletter Mailing Date	Collector's Name (spouse in parentheses) and Home Phone Number	Collector's Mailing Address	Description of Collection
January 1, 1977	Bob Stein (Margie) (312) 465-7320	20 N. Wacker Dr. Chicago, IL 60606 U.S.A.	245 postal scales (letter and parcel). Mainly English and American. A few from Western Europe. All from 1840 on.
F[illegible] 1, 19[illegible]	Michael and Diana Crawforth Sunderland 281209 STD 0783	31 Park Lea, East Herrington Sunderland, ENGLAND SR3 3TA	500 small scales; all types for all purposes. Main concentration is on coin scales (275) and postal scales (100). Also scales for diamonds, pearls, babies, paper, yarn, dentists, apothecaries, bankers, photography, stylus, tea, cock-fighting, persons, snuff, bread, angling, laboratory, butchers, farmers, eggs, grain.
March 1, 1977	Albert Eaches (Billie) (215) 933-2143	R.D. 2 Phoenixville, PA 19460 U.S.A.	487 scales; 72 sets of weights. General collection. Equal arm, unequal arm, coin, gold, postal, egg, spring, household, special purpose.
April 1, 1977	Ruth Willard (Will) (415) 566-3600	P.O. Box 27565 San Francisco, CA 94127 U.S.A.	Approx. 1,000 scales; 5,000 pieces in weight collection. Bulk lies in figurative weights of S.E. Asia, Africa, etc. Fair selection of European 18th and 19th Century weights. A very few ancient weights. Strongest area - Asia, both scales and weights. Good representation of 18th and 19th Century English scales.
October 1, 1977	Utz Schmidt (Ingrid) 05361/701515	Jenaer Str. 32 Wolfsburg 1/ GERMANY	90 scales, 10 sets of weights, 50 single pieces. Letter scales, opium scales, butcher's steelyard, weighbridge, platform scales, beam scales, spring balances, precision scale, yarn balance. Opium weights, German porcelain weights, Ghana gold weights.
July 1 1978	William Doniger (Mary) (415) 841-5234	649 Alvarado Rd. Berkeley, CA 94705 U.S.A.	300 scales; 35 sets of weights. General collection, all types. Specializing in coin scales and weights, nested weights, unusual weights.
November 1, 1978	Eric Newman (Evelyn) (314) 727-0850	P.O. Box 14020 St. Louis, Missouri 63178 U.S.A.	30 scales; 5 sets of weights. American and English coin scales and counterfeit testers.

My first visit to the Crawforth's home in the spring of 1977 strengthened these thoughts. *(pix 07 Crawforth collection)* Michael turned out to be a true gentleman and scholar, addressing him in my first letter with "Sir" was fully justified. With Diana, I bonded immediately. I will never forget the first morning when she served Ingrid, my first wife, and me a cup tea in bed. Their house seemed to have been filled with thousands of scales, every surface; even part of the floor was covered with them. I was even allowed to touch a ladder scale. This is one of the few dreams which never came true for me. (Fig. 8) During this trip I got also from Diana my nickname, well deserved because of the time I used to scour the antique markets in London and along the way for new treasures. Still today I am "scale crazy" as long it is related to price computing scales' ephemera. There is no more lugging of bulky stuff. (That might have to do with having filled all the areas Shirley has allotted to me. Sigh…I have a secret stash in the attic, over a hundred scales, which were never unpacked after my 1985 move to Michigan.)

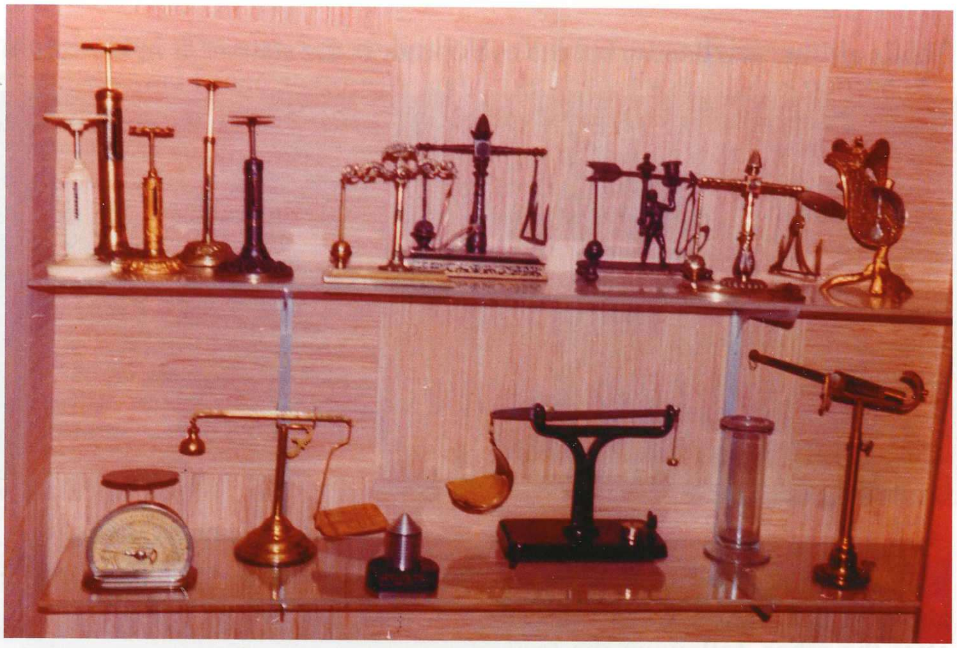


Fig. 7. ⩓⩓ Crawforth Collection.

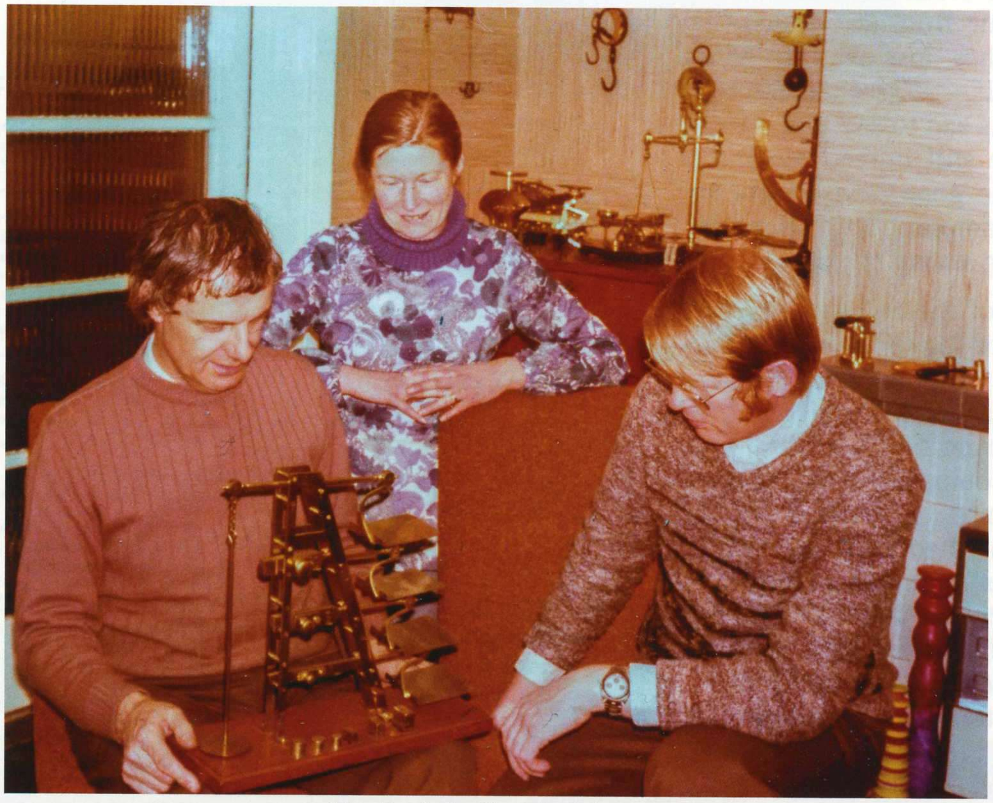


Fig. 8. ⩓⩓ Crawforth home.

It's time to step into the abyss of our initial correspondence, mostly the entertaining side, because our expertise then did not match later articles on the same subject in *Equilibrium* (frequently referred to as *EQM*), with some exceptions, as we see in the following. Keep in mind, we glance now through information and pictures from 1977-78.

Bob Stein, USA, January 1, 1977

As a collector for 25 years, Bob writes, *the usual Sources in the U.S. … have virtually dried up. … All is not gloom, however, because Margie and I went to England in September of '75 and, lo and behold, managed to find 32 letter and parcel scales…All came to light by diligently going to every antique market in greater London – morning and afternoon — during a full week's time. (The second week was spent visiting 150 to 200 antique shops from the Cotswold to Edinburgh and it netted not one scale!)*

That's what I call diligence and Margie certainly was an angel, accompanying him. No wonder that there were no scales in the grazing grounds of Diana and Michael. Every one of Bob's sentences radiates enthusiasm and encouragement and he certainly found ways to round up more members in all parts of the world.

Michael Crawforth, England, 1 February, 1977

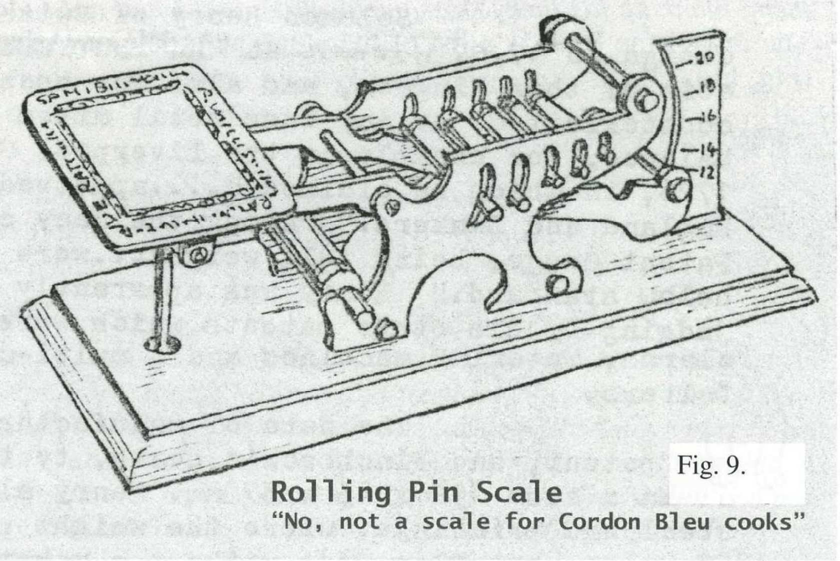


Fig. 9.
Rolling Pin Scale
"No, not a scale for Cordon Bleu cooks"

The first thing you'll notice about this is – that it is quite different from Bob Stein's letter. I have taken him literally and done my own thing! As my enthusiasm leans towards research and technicalities I have biased my letter towards the history and principles of scales. Also I draw better than I write, so there are plenty of sketches included – along with spelling mistakes and typing errors!... I volunteered (fool that I am!) to draw up some sheets of terms we are all likely to need to communicate. Attached were 6 pages full of drawings and explanations, which were over time amended to *Mike's Bible for scale collectors and hoarders*, the *Handbook of Old Weighing Instruments*. At a later time I observed Michael make a perspective sketch, like the attachment of a rolling-pin scale, within a few minutes. He became my teacher and idol for when I made sketches of ideas for future automotive parts. (Fig. 9)

Albert R. Eaches, USA, March 1, 1977

Albert was already quite versed in scales, when he joined. He started with, *Greetings to Scale Collectors. When I started to collect scales about 17 years ago I felt that I was the only one. I could find no information about scales and no other collectors. Now through the efforts of Bob Stein, who has ferreted out many other collectors, I find myself among a goodly group of collectors.* Even though he closed with the excuse of not having better illustrations, his sketches of the various types of trade scales were for me a revelation and intrigued me to study the multiple principles and designs of scales. *(Fig. 10a, b, c)*

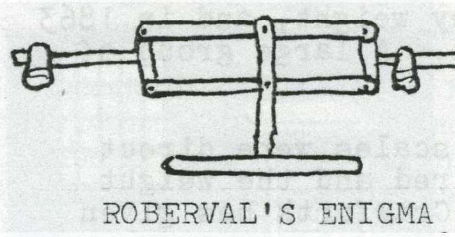


Fig. 10a. ⋀⋀

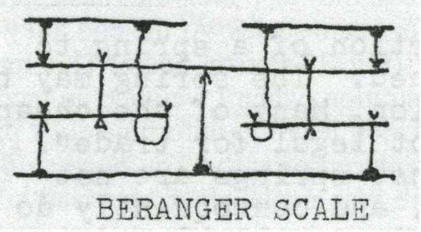


Fig. 10b. ⋀⋀

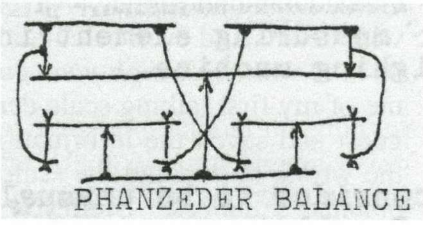


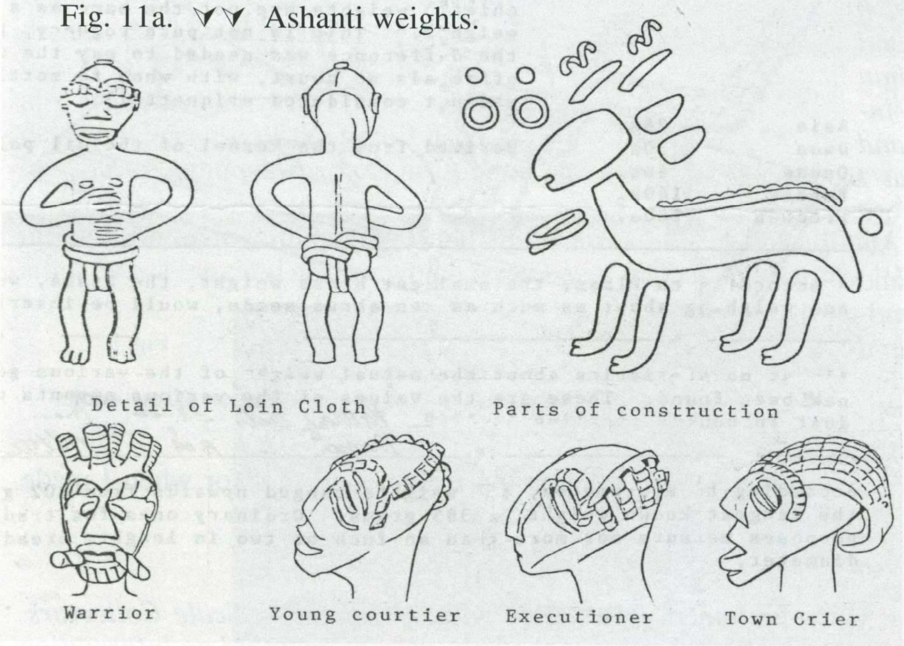
Fig. 10c. ⋀⋀

Ruth Willard, USA, April 1, 1977

Ruth seemed to have been, from day one on, the Czarina of scales, not only in the quantity of stuff but also in historical research and knowledge. Her view of life, expressed in her introduction, reminds me of my mother with her love of music, placing cooking and household chores at the end of importance. *Becoming a collector of anything – especially anything that required dusting – was the farthest thing from my mind as a young person. However, I have always admired the sculptural quality of both scales and weights, and wanted a few decorative accents. How could I have anticipated the spell these beautiful objects would cast upon me and my husband, Will, whose skills at repairing and restoring my acquisitions has made it practicable to buy many otherwise unusable scales?*

"At first I gathered anything and everything I found. Nothing remotely resembling an old scale was too forlorn or bedraggled to appeal to me, we lugged them all home, and Will good-naturedly reconstructed them, thanking his lucky stars, meanwhile, that I had not suddenly decided to collect stray dogs or cats… The rest of the letter is a list of literature, an article on Ashanti weights, and mysteries in her collection. (Fig. 11a, 11b)

Fig. 11a. ▼▼ Ashanti weights.



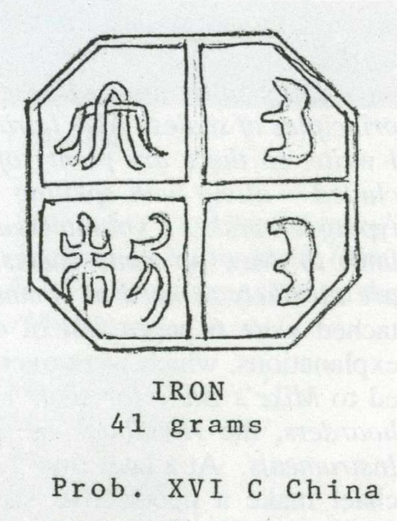


Fig. 11b. ▲▲ Mystery weight.

Alex Renton, England, May 1, 1977

Gwen and Alex, both at colleges, apologize for a delay, because of special events in the Sailing Club and the climax for Gwen, the Ranger Guide Diamond Jubilee. Nevertheless, they also took their task seriously with details and even calculations for beam scales. At the end, they show us *how you can weigh your guest*. (Fig. 12 Person Scale) This reminds me of my first talking scale demonstration, when I weighed an incoming guest and saved the information. Upon leaving, unfortunately I pushed the wrong button and the scale announced proudly: *You have gained 12 pounds, 5 ounces.* I tell you, there was no laughter but dead silence. Shirley banned the scale from the premise, breaking up my test series.

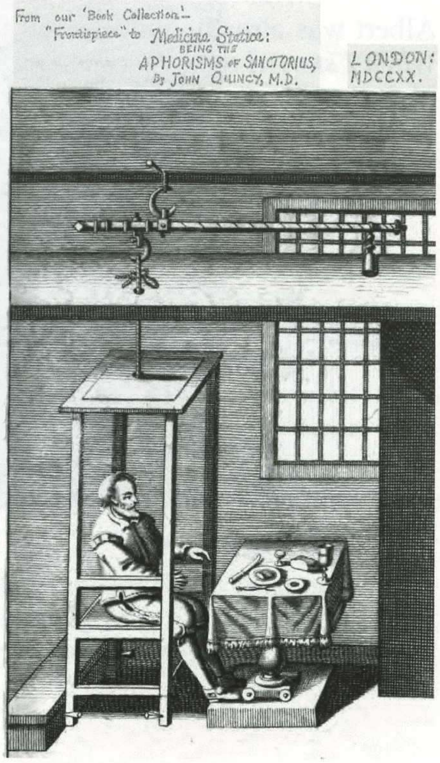


Fig. 12. ➤➤ Person Scale.

Morton Wormser, USA, June 1, 1977
Morton wrote: *Many times I have been asked why collecting scales and weights? I must be quite candid. It was not because of my interest in one of the first needs of civilization, namely measuring or the science of metrology. Possibly for a quarter of a century I received daily reminders of the importance of accurate scales. Being in the coal industry I was constantly aware of our fleet of trucks, traveling over platform scales at our yards – maybe all this played a part.*

He had started collecting in 1947 and brought oodles of scales from every trip. His customs experience is a prize winner. *After one of our trips abroad, we arrived in New York. The trip had netted a dozen new finds from Denmark, France, Switzerland and England. Noting the customs officer's perplexed study of the unusual declaration, and not waiting to be classified as a dealer, I said, You know I'm a collector of antique scales. The inspector paused for a long moment, wagged his head in disbelief and replied, 'Well, now I've heard everything."* His letter was accompanied with sketches, one a Meloney scale with cards. At the time I just glanced over it; years later it was on my wanted list, *"Dead or Alive."* (Fig.13)

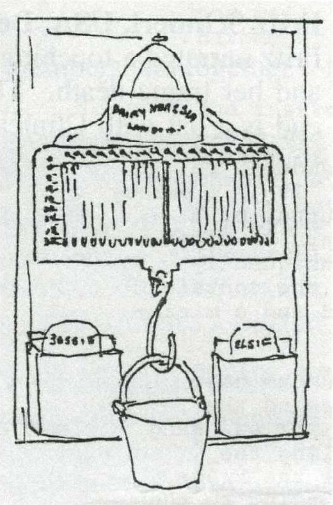


Fig.13. ⋀⋀
Meloney Scale.

Arthur Keir, USA, July 1, 1977
Arthur was rather a collector than a historian. Collecting miniatures since he was eight, he had attached pictures of his letter scales. His field of interest comprised also miniatures of guns, books, knives, children's games, walking sticks, magic lanterns and Leica cameras.

Brian Brass, England, July 1, 1977
Brian's first page started with a Guidonia Hand he named "Medieval Scales." Later on he introduces the household. "*We have three children, a dog, two horses, three chickens and tropical fish – what the hell do I need scales for (I keep asking myself)? I regard myself as a part time collector (ashamedly, I have never been at Portobello Road market and have yet to visit the legendary Arthur Middleton in his Barrett Street hideaway)…then I found myself qualified as an accountant in a professional association where the symbol is a pair of scales.* He continues that *scales stimulate historical enquiries and the objects have considerable beauty.* He entices visits with his stocking a good brand of whiskey, as Bob and Marge can testify.

David Colker, USA, August 1, 1977
David and his wife enjoyed the experience of discovering new treasures during frequent business trips. There was no time for anything else, it's all in work. I can sympathize with him; until retirement I was in the same boat.

Dennis Vorley, England, September 1, 1977
For 42 years Dennis already had collected numismatics, leading to coin weights and scales. He broadened our horizon with articles on *Seeds And Berries Used As Weights And Measures* and *Early Arabic Glass Weights.*

Virginia Lee Jones, USA, September 1, 1977
Virginia liked antiques and ran her Country Store while her husband tended to their 1,300-acre cattle ranch. She was willing to part with everything but her scales. Wow!

Utz Schmidt, Germany, October 1, 1977
"Here is another *scale crazy* collector." I was serious back then; nothing funny in my story about meeting the Crawforths, instead I wrote an article *Be Careful With Nesting Weights* and *Medical And Apothecaries' Weights.* I felt obliged to warn the other members from buying, like me, a worthless reproduction nesting weight set out of lead.

Kenneth Buck, USA, November 1, 1977
Kenneth found a really nice article on the history of weights. "With no historical records to the contrary, we may assume that early man first developed a means for weighing objects as a result of his own curiosity about the world around him. *How High? How Fast?* And, when lifting stones, *How Heavy?* "

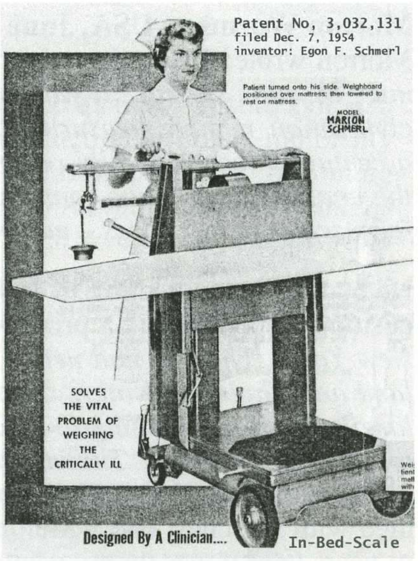

Patent No, 3,032,131
filed Dec. 7, 1954
inventor: Egon F. Schmerl
Patient turned onto his side. Weighboard positioned over mattress; then lowered to rest on mattress.
MODEL
MARION SCHMERL
SOLVES THE VITAL PROBLEM OF WEIGHING THE CRITICALLY ILL
Designed By A Clinician....
In-Bed-Scale

Fig. 14. ⩓⩓ Schmerl's In-Bed-Scale.

Fritz Schmerl, USA, December 1, 1977
Fritz narrated a touching story on patient Vera's sickness, the medical details and her tragic death. This inspired him to invent the In-Bed-Scale. At the end is a list with Clinical Conditions when an In-Bed-Scale should be used. (Fig. 14)

Donald Gorlick, USA, February 1, 1978
I have little, bordering on no, interest at all in scales. My collection is on counterfeit coin detectors… We learned all about modifying coins and the balances used.

Norman Sturgess, USA, March 1, 1978
For many months have had 'n idea for the letter and have received the monthly letters with certain forebodings because I had no backup idea and was afraid that my subject would be used before I had a chance to use it. But luck was with me and my subject is still open. Norman listed a series of books, commented by him.

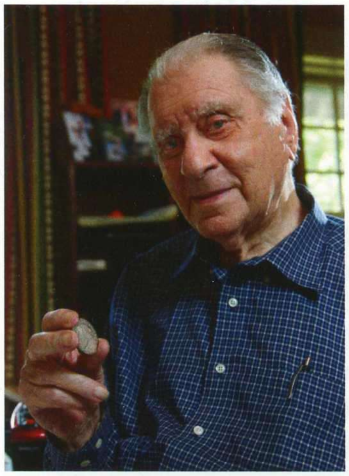


Fig 15. ⩓⩓ Eric Newman.

Eric Newman, USA, November 1, 1978
What a pity we never got his letter, for reasons told in the following paragraph. Eric, a graduate of business and engineering, fell in love with numismatics and had been publishing multiple papers since 1949. Realizing the relation between the weight and size of a coin and its use in trade, by the time he applied for ISASC membership he had added 30 American and English coin scales and counterfeit testers. His wife Evelyn encouraged his collecting, helping in the hunt during their trips all over the world. Joining ISASC when he was a youngster of 67, Eric celebrated his 105th birthday on May 25, 2016, still quite involved in his collections! His children think his drive to collect and do research keeps their dad young and alert. (Fig. 15-19)

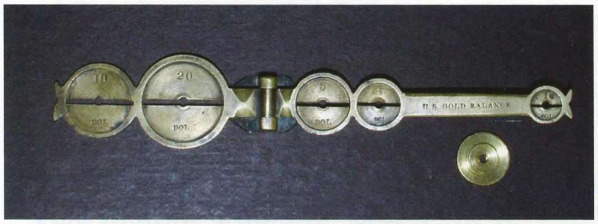
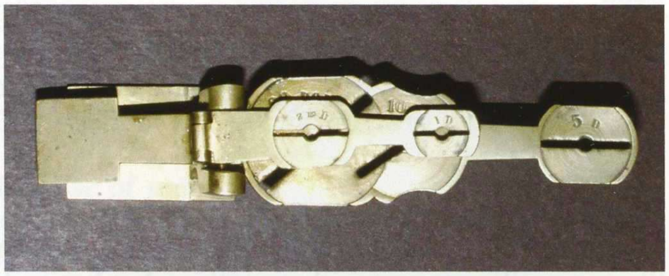
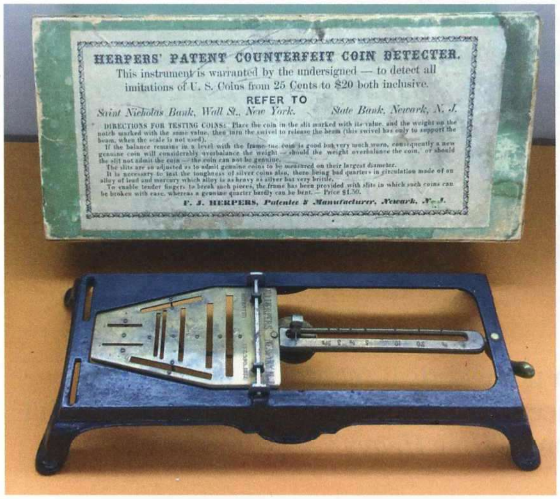


Fig. 16. Allender CCD.

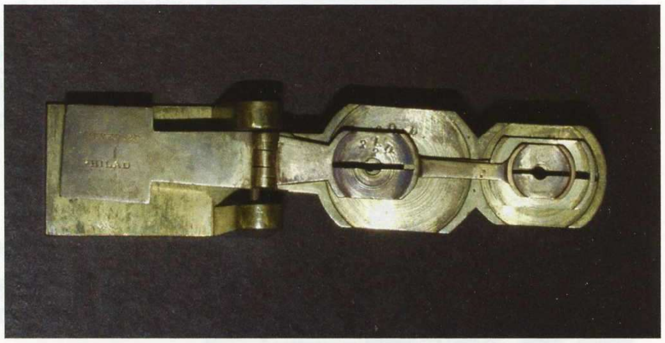


Fig,. 17. ⩓⩓ Myers & Co. CCD.



HERPERS' PATENT COUNTERFEIT COIN DETECTER.
This instrument is warranted by the undersigned — to detect all imitations of U. S. Coins from 25 Cents to $20 both inclusive.
REFER TO
Saint Nicholas Bank, Wall St., New York. *State Bank, Newark, N. J.*
DIRECTIONS FOR TESTING COINS: Place the coin in the slit marked with its value, and the weight on the notch marked with the same value, then turn the swivel to release the beam (this swivel has only to support the beam, when the scale is not used).
If the balance remains in a level with the frame the coin is good but very much worn, consequently a new genuine coin will considerably overbalance the weight — should the weight overbalance the coin, or should the slit not admit the coin — the coin can not be genuine.
The slits are so adjusted as to admit genuine coins to be measured on their largest diameter.
It is necessary to test the toughness of silver coins also, there being bad quarters in circulation made of an alloy of lead and mercury which alloy is as heavy as silver but very brittle.
To enable tender fingers to break such pieces, the frame has been provided with slits in which such coins can be broken with ease, whereas a genuine quarter hardly can be bent. — Price $1.50.
F. J. HERPERS, *Patentee & Manufacturer, Newark, N. J.*

Fig,. 18. ⩓⩓ Herpers' Patent CCD.



Fig,. 19. ⩓⩓ Myers & Co. CCD.

Bob Stein Comes Out of the Woodwork – End of March, 1978

After a successful beginning and growing to 80 members, Bob consulted with several members and together they decided that changes were needed. In Bob's letter to the members:

> However, in coming of age, a number of growing pains have occurred, the effect of which has caused us to take a new look at ISASC and to recognize the need to reorganize it and, in so doing, insure its viability. The most serious problem to be faced is the growing indication that our newsletter exchange is simply not working satisfactorily, and to realize that if it is not serving our needs properly, then our viability is in jeopardy. It serves no purpose to dwell on the reasons for the newsletter's failure. Let it suffice to note that at this writing a large percentage of members simply have not fulfilled their obligation, and certain others, well-intentioned but lacking sufficient knowledge, have written newsletters that do not satisfactorily serve our posture as a professional society.
>
> To alleviate this situation, it has been decided to eliminate the newsletter and, instead, to publish a quarterly magazine on scales and scale-collecting. Michael Crawforth has agreed to become editor of the magazine, for which services he will be paid. Members also will be invited to submit articles for inclusion in the magazine. In order to finance our magazine and defray the administrative costs of our Society, we are instituting membership dues of $27 per calendar year, pro-rated the first year at $2.25 per month for the number of months involved.

True, most of us were beginners and like today, the majority of our members are not interested or have the time to delve into research and write about it. The rather suddenly raised bar from chatting about scales to a professional society continues to provide us still today with first-class information. A board of directors was proposed with him as the chair, a position he held until December 1999. The best part of the letter was the enclosed inaugural copy of *Equilibrium*, Spring 1978. Bob closed with, *I'm sure you'll all agree that it's really quite excellent and something we all can be proud of.* The first issue was truly very impressive with pictures and an array of marvelous sketches from Michael Crawforth. Shown as example is a person scale. (Fig. 20)

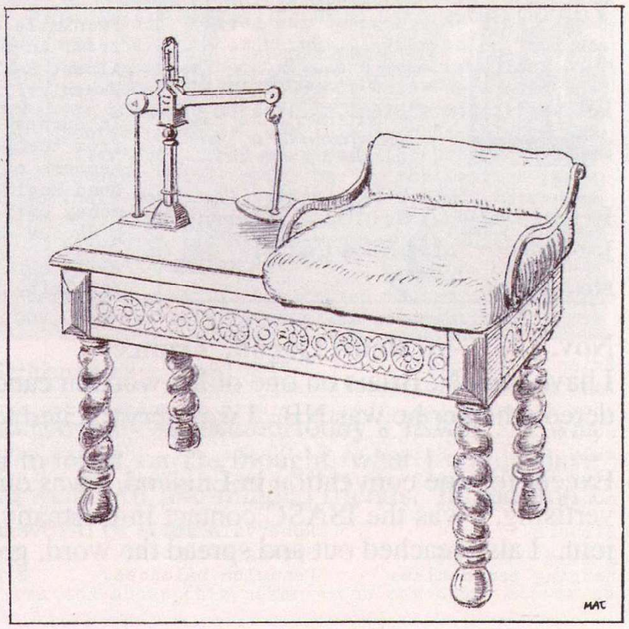
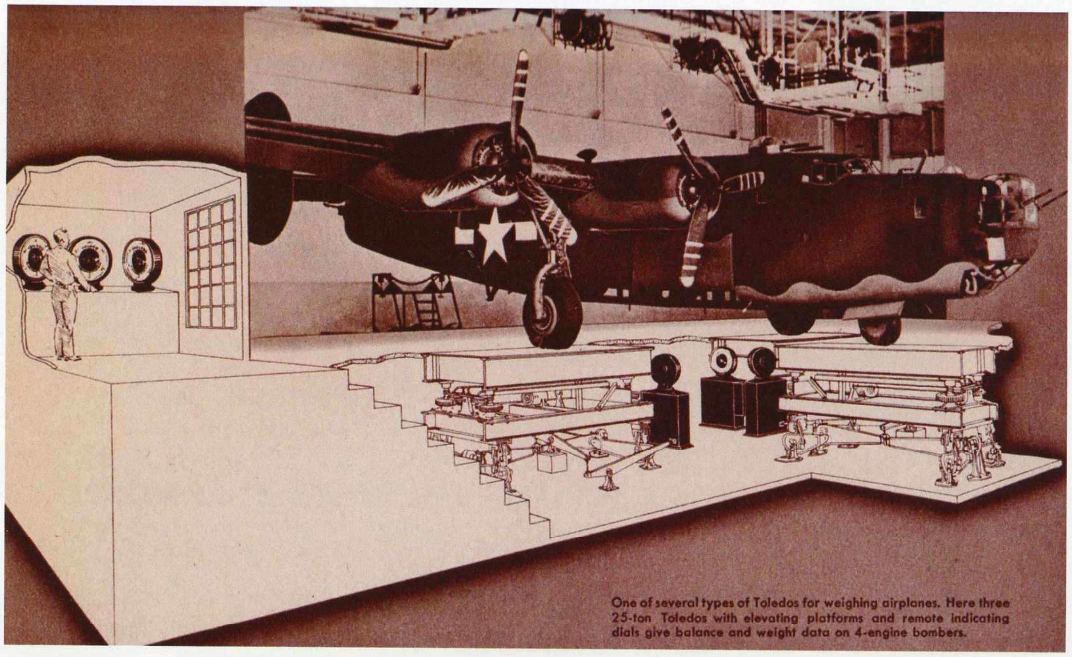


Fig. 20. ➢➢ Person Scale by Young & Son drawn by Michael Crawforth. EQM Spring 1978, page 18.

The golden years of ISASC had started – Bob did not mention all the arm twisting he had to do to convince Michael to be the editor. Diana was volunteered as the assistant editor, the historian, and the developer of the vocabulary used ever since in EQMs. Meanwhile, Michael reached out to the international world of scale enthusiasts. Please enjoy some of his examples.

July 1978 – to Max Gasser, USA
I would be most grateful if you would write your proposed article on weighing aircraft. (Fig. 20)



One of several types of Toledos for weighing airplanes. Here three 25-ton Toledos with elevating platforms and remote indicating dials give balance and weight data on 4-engine bombers.

Fig. 21. ⩓⩓ Weighing an airplane

Oct 1978 – to Gerard Houben, The Netherlands
If you could see the scale you would immediately know that it is not a diamond scale. I have several examples of diamond scales, & know their common features. This Scale has shallow pans, & a locker without holes for weights.

Jan 1980 – to Hans Jenneman, Germany
You do me a great honor to spend so much of your valuable time writing these long letters.

Thank you for your comments about my book. It is very encouraging to hear that people appreciate my efforts. I enclose diagrams of how I take photos to prevent shadows spoiling the images. Flash photos are not good for taking scales.

Feb. 1980 – to Professor Herkenhoff, Brazil
I was most interested that you are researching scales & weights in Brazil. I'm sure our members would enjoy reading about this subject.

Nov. 1981 – to Henri Gaçon, France
I have seen N. Briais on one of his wooden candlestick scales (patent 28419) when I was in USA, & I wondered whether he was NB. I was very excited to get your proof & dates of his patents. Thank you very much.

Except for one convention in England, I was quite isolated in Germany. Even though Bob did most of the advertising, I was the ISASC contact in Germany, in most cases the first contact for Germans with the intent to join. I also reached out and spread the word, growing ISASC steadily.

Our joint efforts are reflected in the picture of the rapid growth (Fig. 22) and in the attendance of the Sindelfingen convention I had arranged in April 1983. Sixty-four guests attended, 39 of them collectors. This convention was truly international: 21 Germans, 5 from the Netherlands, 3 from USA, 3 from GB, 3 from Switzerland, 2 from France and 2 from Belgium. Jan Berning, then Jan Miller with her husband stationed in Germany, still loves to talk about this memorable feast of scales and food. *(Fig 23 & 24)* Unfortunately, with my move to Michigan in 1985 and the lack of a local go-to, the Germans decided in 1987 to start their own society – Mass-und-Gewicht – mostly for language reasons but also to preserve their own country's vast history of weights and measures. France and the Netherlands followed soon thereafter.

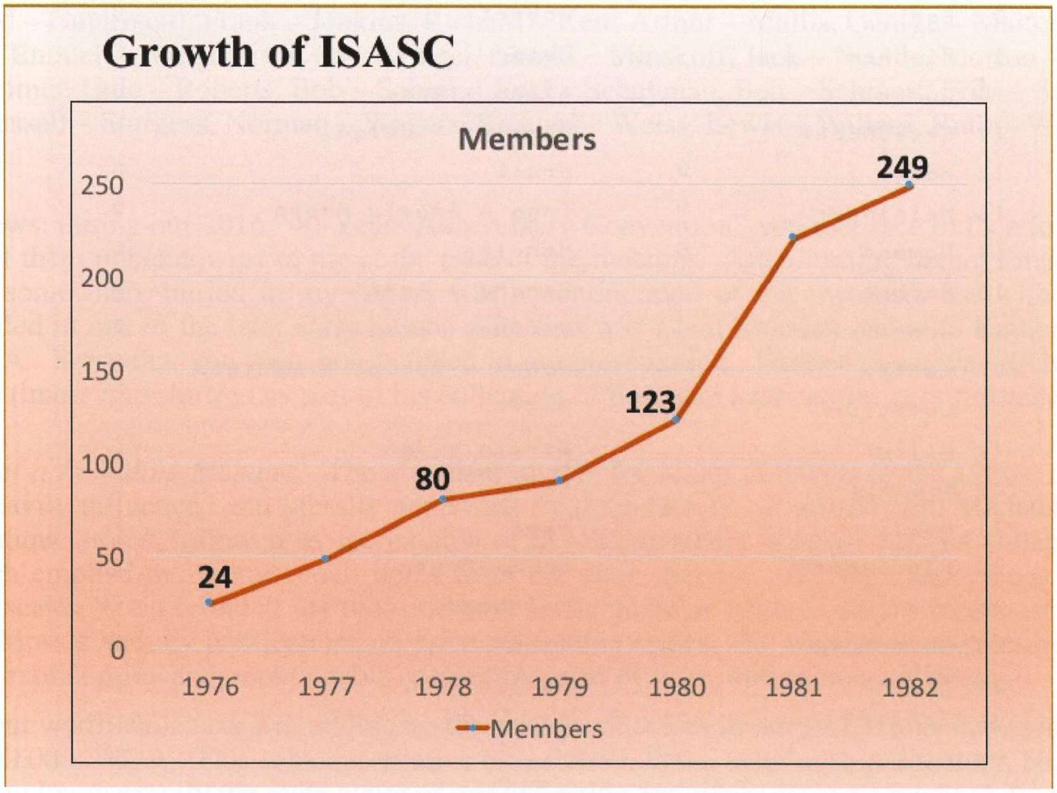


Fig. 22. ⮝⮝ Rapid growth of ISASC.

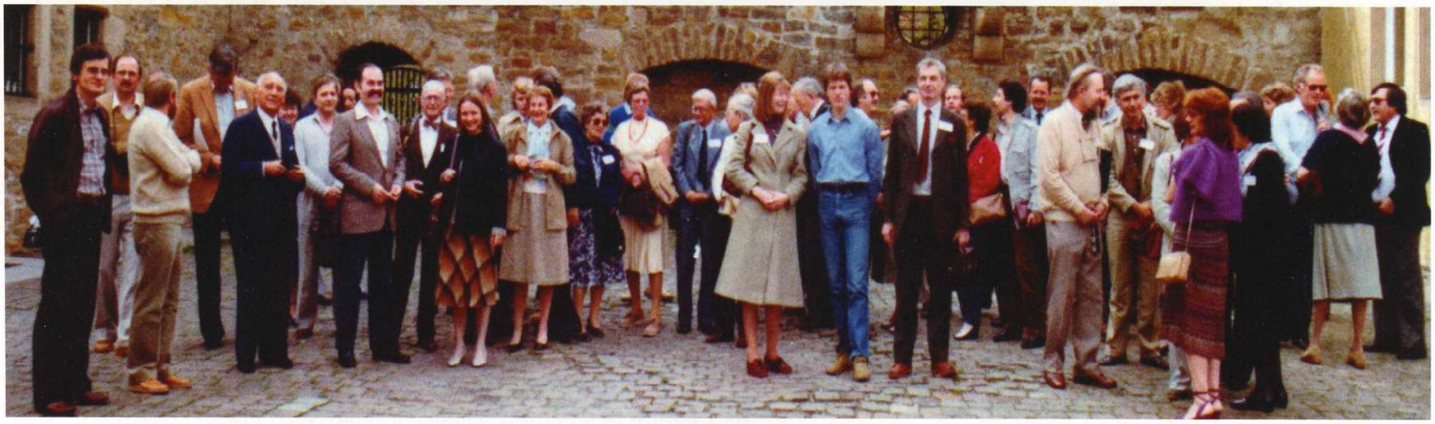
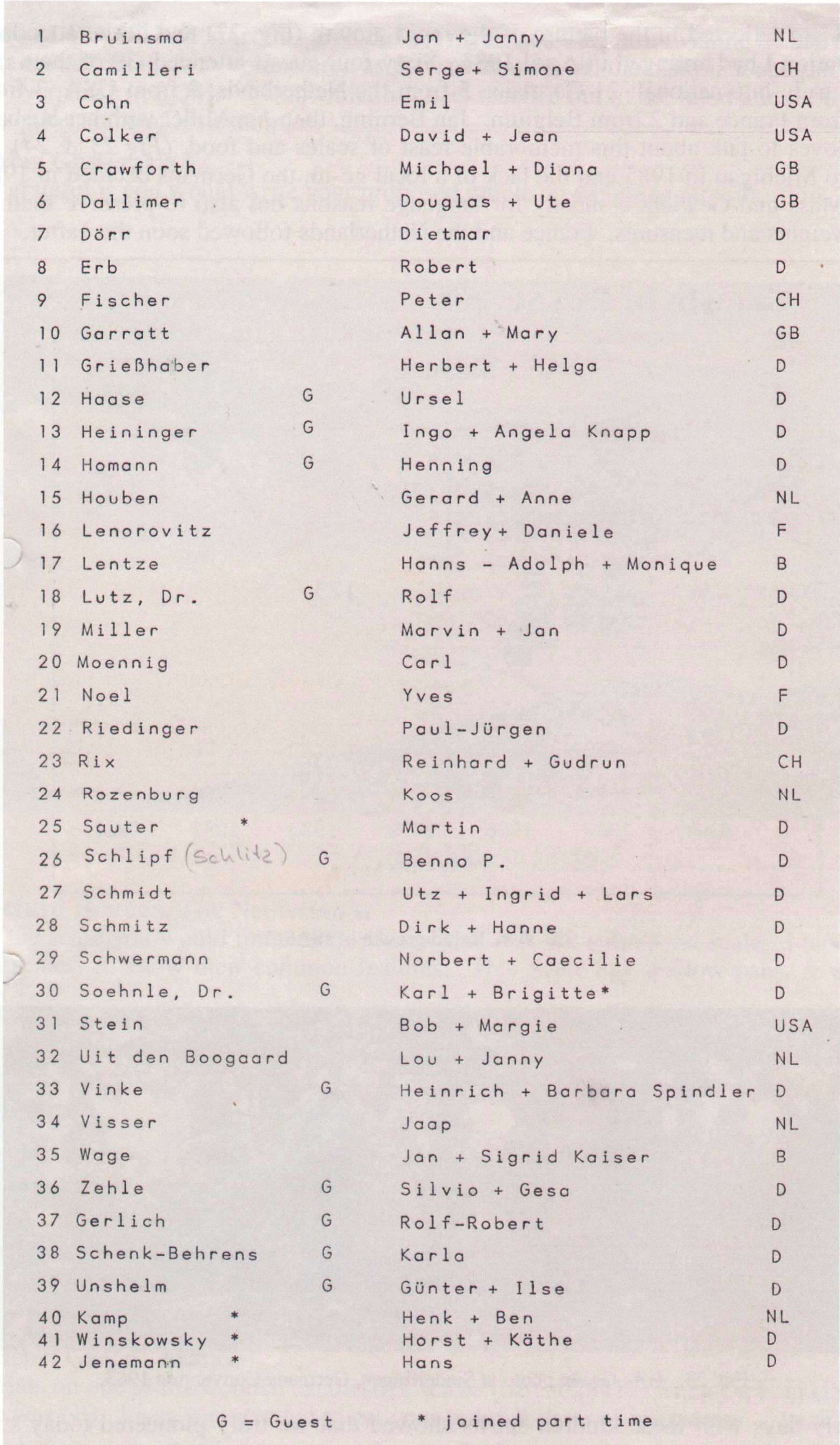


Fig. 23. ⮝⮝ Group photo at Sindelfingen, Germany Convention 1983.

Reliving the early days with these kindred spirits showed that we truly pioneered today's ISASC. I was proud to join, to be a member for 40 years. Reflecting for a moment on the thought, what I would have missed in a world without ISASC, one item comes to mind, the wealth of like-minded friends. In addition I was lucky to quench at least a bit of my thirst to learn about the world of scales.



1	Bruinsma		Jan + Janny	NL
2	Camilleri		Serge + Simone	CH
3	Cohn		Emil	USA
4	Colker		David + Jean	USA
5	Crawforth		Michael + Diana	GB
6	Dallimer		Douglas + Ute	GB
7	Dörr		Dietmar	D
8	Erb		Robert	D
9	Fischer		Peter	CH
10	Garratt		Allan + Mary	GB
11	Grießhaber		Herbert + Helga	D
12	Haase	G	Ursel	D
13	Heininger	G	Ingo + Angela Knapp	D
14	Homann	G	Henning	D
15	Houben		Gerard + Anne	NL
16	Lenorovitz		Jeffrey + Daniele	F
17	Lentze		Hanns - Adolph + Monique	B
18	Lutz, Dr.	G	Rolf	D
19	Miller		Marvin + Jan	D
20	Moennig		Carl	D
21	Noel		Yves	F
22	Riedinger		Paul-Jürgen	D
23	Rix		Reinhard + Gudrun	CH
24	Rozenburg		Koos	NL
25	Sauter	*	Martin	D
26	Schlipf (Schlitz)	G	Benno P.	D
27	Schmidt		Utz + Ingrid + Lars	D
28	Schmitz		Dirk + Hanne	D
29	Schwermann		Norbert + Caecilie	D
30	Soehnle, Dr.	G	Karl + Brigitte*	D
31	Stein		Bob + Margie	USA
32	Uit den Boogaard		Lou + Janny	NL
33	Vinke	G	Heinrich + Barbara Spindler	D
34	Visser		Jaap	NL
35	Wage		Jan + Sigrid Kaiser	B
36	Zehle	G	Silvio + Gesa	D
37	Gerlich	G	Rolf-Robert	D
38	Schenk-Behrens	G	Karla	D
39	Unshelm	G	Günter + Ilse	D
40	Kamp	*	Henk + Ben	NL
41	Winskowsky	*	Horst + Käthe	D
42	Jenemann	*	Hans	D

G = Guest * joined part time

Fig. 24. ⩓⩓ Attendance listing of those a Sindelfingen, Germany, April 1983.

In conclusion, here is a list of all 48 initial members, sorted by country in alphabetical order. (**living**)

England: Baharie, Mary – Bradbury, Derrick – **Brass, Brian** – **Crawforth, Diana** & Michael – Lee Jones, Virginia – **Middleton, Arthur** – Mussell, John – Phillips, Neil – Renton, Alex – Vorley, Dennis
Germany: **Schmidt, Utz**
Netherlands: Thürkôw, Guus
USA: Berman, Eugene – Buck, Kenneth – Carley, Thomas – Chandler, Herb – Cohn, Emil, Jr – Colker, David – Cosentino, Joel – Di, Peter – **Doniger, William** – Eaches, Albert – Gasser, Max – Gorlick, Donald – Guglimetti, Frank – Jenkins, Richard – Keir, Arthur – Mallis, George – Malter, Joel – McDonald, Emmett – McGinnis, Lyle – Mindel, Gerald – Minskoff, Jack – Needle, Morton – **Newman, Eric** – Plummer, Gale – Roberts, Bob – Sabini, Lloyd – Schayman, Ben – Schmerl, Fritz – Stein, Bob – Stevens, Russell – Sturgess, Norman – Wagers, Richard – Weiss, Lewis – Willard, Ruth – Wormser, Morton

Exciting news: during our 2016 "40-Years Anniversary Convention" you met face to face four early members, two of them unbeknownst to me at the time of the meeting. After coming home, I made an exciting discovery; somewhere buried in my papers was a continuation of the members list with 25 additional names, mailed in one of the later early letters. The first was Clem Monday and wife Katherine already in Oroville, CA. Sorry that you were not included in my presentation. Further down was Richard Axelrood, another old timer, who showed us part of his collection of beautiful letter scales at our usual Friday tour.

Reflection of a Founding Member. The abundant market for scales, a trinket in the 1960s, not worth selling, was heavily influenced and literally wiped out by three factors. It started with Michael's sketches in England antique stores, followed by the passion of ISASC members, a newly formed collectors' group in 1976, which emptied the pretty, small items from the store shelves. The big clunky ones left, the price computing scales, often found at the roadside next to the garbage, became attractive almost 40 years later with Greg Moss's and my publications on price computing scales. No wonder that scales became categorized as an exotic, pricy and unobtainable species for most of us as well as new collectors.

A tedious but worthwhile task was adding up the number of scales in our collections in America, amounting over 100,000. WOW! This is a conservative total, based on the membership directory, because most of us don't even know exactly the scale count of our collection and others have no intent to give the true numbers.

I close with Bob Stein's words from his March 1978 letter: "*We all agree on one thing, namely that ISASC* – with Ned Shaeffer 100 and Eric Newman 105 years old – "*has come of age.... However, in coming of age, a number of growing pains have occurred, which has caused us to take a new look at ISASC...* At its core, ISASC is still an association of collectors, and *Equilibrium* is a high-quality publication. Yet, in 40 years, we have seen digital everything, Google and Wikipedia replacing the encyclopedia, and phones (without a dial!) being replaced every two years. So where does that leave the relevance of "collecting" – of old-fashioned research and discovery; of an appreciation for the historical context, beauty, and ingenious design of "everyday" items? Or, to put it differently, the challenges of forty years ago are basically the same today; just the details are different.

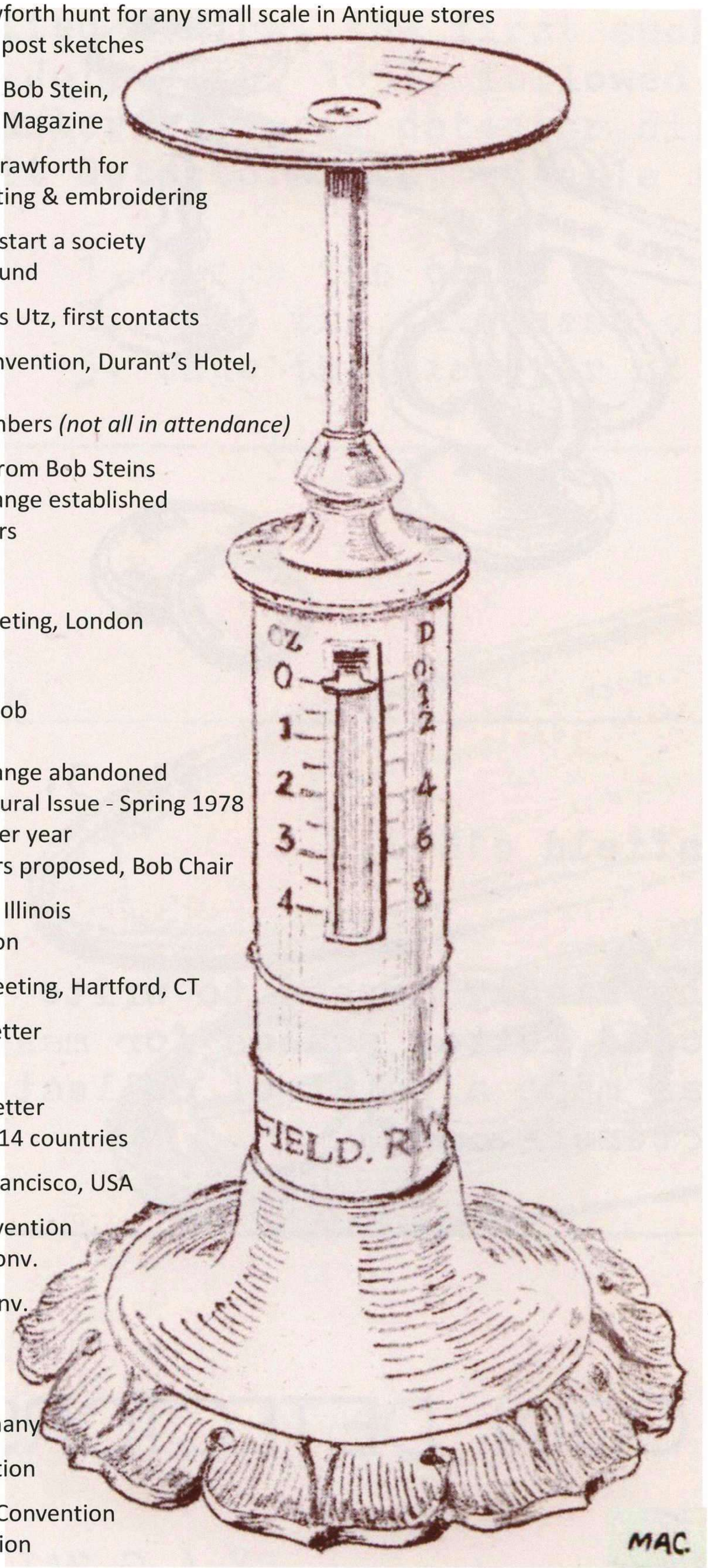
References:

Some information was obtained in discussions with Diana Crawforth-Hitchins, Jan Berning and Bob Hayden.
All literature is part of the Utz Schmidt collection

1. ISASC members Newsletter exchange Jan 1977 to March 1978
2. ISASC Chairman's Newsletters 1978 Dec to 1979 Aug
3. Initial correspondence with Michael Crawforth and Bob Stein
4. Early correspondence from Michael Crawforth, provided by Diana
5. Pictures 2, 3: Initial correspondence with Michael Crawforth and Bob Stein
6. Pictures 8, 9: visit at Michael & Diana Crawforth
7. Pictures 18, 19 Sindelfingen Convention
8. Pictures 21 to 25 Eric Newman collection
9. Pictures others: ISASC members Newsletter exchange Jan 1977 to March 1978

ISAC TIMELINE – The First Ten Years

1970s	Michael & Diane Crawforth hunt for any small scale in Antique stores & on fairs of England, post sketches
1973	Michael sent letter to Bob Stein, read article in an Ant. Magazine
1974	The Steins meet the Crawforth for Scale talk. Marge knitting & embroidering
1975	Bob urges Michael to start a society Kindred souls were found
1976 July, August	Michael's flyer catches Utz, first contacts
Sept. 25	ISASC 1st "official" Convention, Durant's Hotel, London, England **24** founding members *(not all in attendance)*
1977 January	1st ISASC Newsletter from Bob Steins Newsletter exchange established **48** initial members
Feb. to Dec.	Newsletter Exchange
September	1st Members Mini-Meeting, London
1978 Jan. to Mar.	Newsletter Exchange
March	2nd Newsletter from Bob **80** members Newsletter Exchange abandoned 1st Equilibrium - Inaugural Issue - Spring 1978 ISASC Fees $27 per year Board of Directors proposed, Bob Chair
Aug. 25	ISASC incorporated in Illinois Non Profit Organization
October	2nd Members Mini-Meeting, Hartford, CT
December	1st Chairman's Newsletter **90** members
1979 August	3rd Chairman's Newsletter **123** members in 14 countries
	1st Convention, San Francisco, USA
1980	London, England Convention New York City, USA Conv.
1981	Delft, Netherlands Conv. **221** members
1982	**249** members
1983	Sindelfingen, W-Germany
1984	Chicago, USA Convention
1986	Washington DC, USA Convention Paris, France Convention



ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2016 ISSUE NO. 4 PAGES 4301 - 4328

Cover Picture

This mixture of toy scales are of American, German and Japanese manufacture. Arcade Manufacturing Company of Freeport, Illinois made the cast iron Howe and Toledo toys as well as the beam scale. The colorful tin scale in back center is believed to be made in Japan and the small tin spring scale bearing a windmill on its face was made in Germany. They measure 3" to 6" tall and 2¼" to 6" wide.

Arcade was in business from 1885 to 1945, but only made cast iron toys from 1900 to 1945.

Berning Collection.

Contents

Have you Ever Seen Weights Like These?
Ernie Segundo 4303-4305
Notes & Queries No. 162 4305
Making Cast Iron Weights
Stephen Barnett 4306–4312
An Early Multi-Coin English Rocker Balance Maker – C. Pinchbeck
Michael Foster 4313-4319
James Ferguson's Misidentified Coin Balance
Tacye Phillipson 4320-4321
Showcase 4321
Benjamin Dearborn: Vibrating Steelyards and Gold Standard Balances
Deborah Warner 4322-4328

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

EQUILIBRIUM is published quarterly in February, May, August and November.

© 2016 International Society of Antique Scale Collectors

ISSN: 0893-2883

International Society of Antique Scale Collectors
Founded September 1976
Internal Revenue Service 501 (c) (3) EIN 36-2976411
Tel 612.925.1386
www.isasc.org

Officers 2016

President........................Bob Hayden
Vice Presidents.....................Greg Hill
...............................Jerome Katz
...............................Greg Moss
.........................Mary Anne Murphy
...........................Shirley Schmidt
Secretary......................Carol Hayden
Treasurer.......................Kurt Beyreis

For membership information contact
Shirley Schmidt sschmidt@avci.net
5790 N. Lakeshore Rd. Palms, MI 48465

Published with the co-operation and support of
ISASC Europe
Founded October 1993
Charity commissioners for England & Wales No 1037558
www.isasce.com

Trustees and Officers 2014-2016*

Chairman....................John Knights*
Secretary..................Thomas Allgeier*
Treasurer.....................Mike Sharpe*
Meeting Secretary...............Peter Elliott
European Representative.........Jaap Visser
Publications Officer.............David Apps
Information Officer......D Crawforth-Hitchins

For membership information contact
John Knights, johnsknights@btinternet.com

Editor: Jan H. Berning, **Tel** 815.895.6328 Fax 815.895.6328 JHBerning@comcast.net
Associate Editor: Charley Amsbaugh **Tel** 443.952.7681 research.eggscales@comcast.net
Associate Editor: Diana Crawforth-Hitchins **Tel** 01865.763096 lehitchins@gmail.com

Article submissions are preferred in MS Word with Times New Roman Font size 12.
Photos are best in 300 DPI Jpegs in a separate file with a maximum of 3 photos per Email.

Have You Ever Seen Weights Like These?

BY ERNIE SEGUNDO

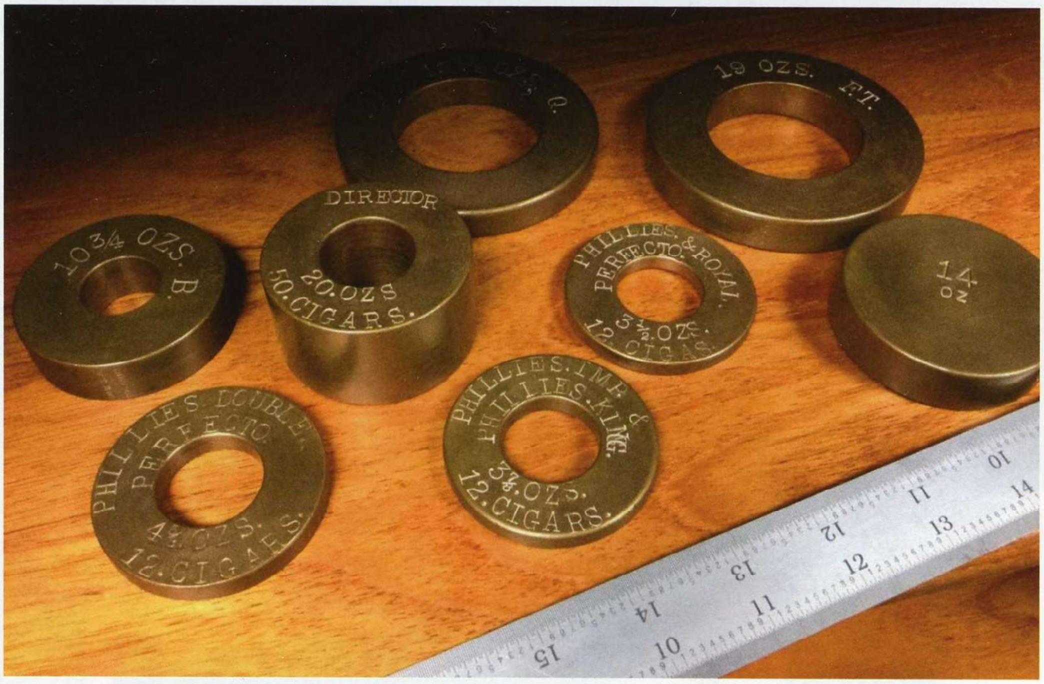


Figure 1. ➢➢

These interesting annular and disc-shaped weights of finely manufactured brass are very specialized for use in the cigar manufacturing industry. Though uncertain as to whether they were used for measuring the raw materials or finished product, likely uses include manufacturing economy (to ensure appropriate amounts of filler tobacco) and quality control (for consistent weight/moisture of the cigars). They refer to the weight of different varieties of cigars in groups of either a dozen (3½ to $4^5/_8$ oz.) or fifty cigars ($10^3/_4$ to 20 oz.) and are marked accordingly. (see figures 1 & 2). When cigars were hand-rolled, they were produced then bundled into groups of fifty.

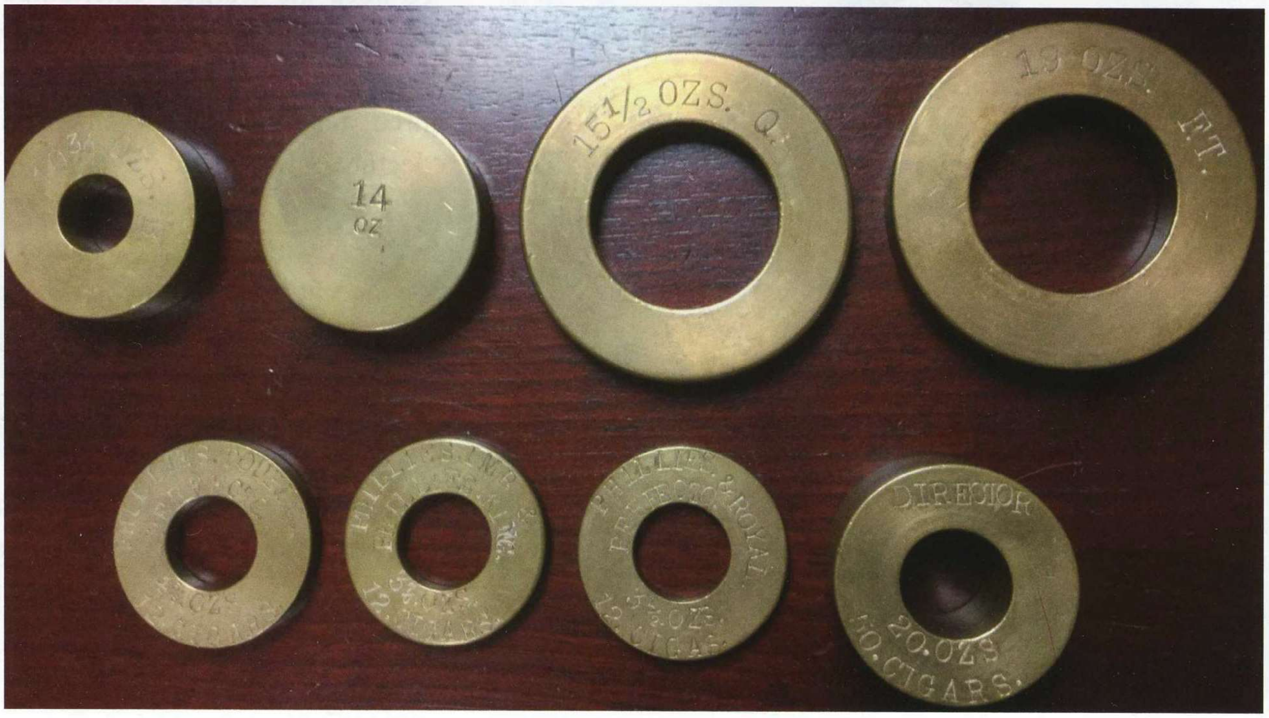
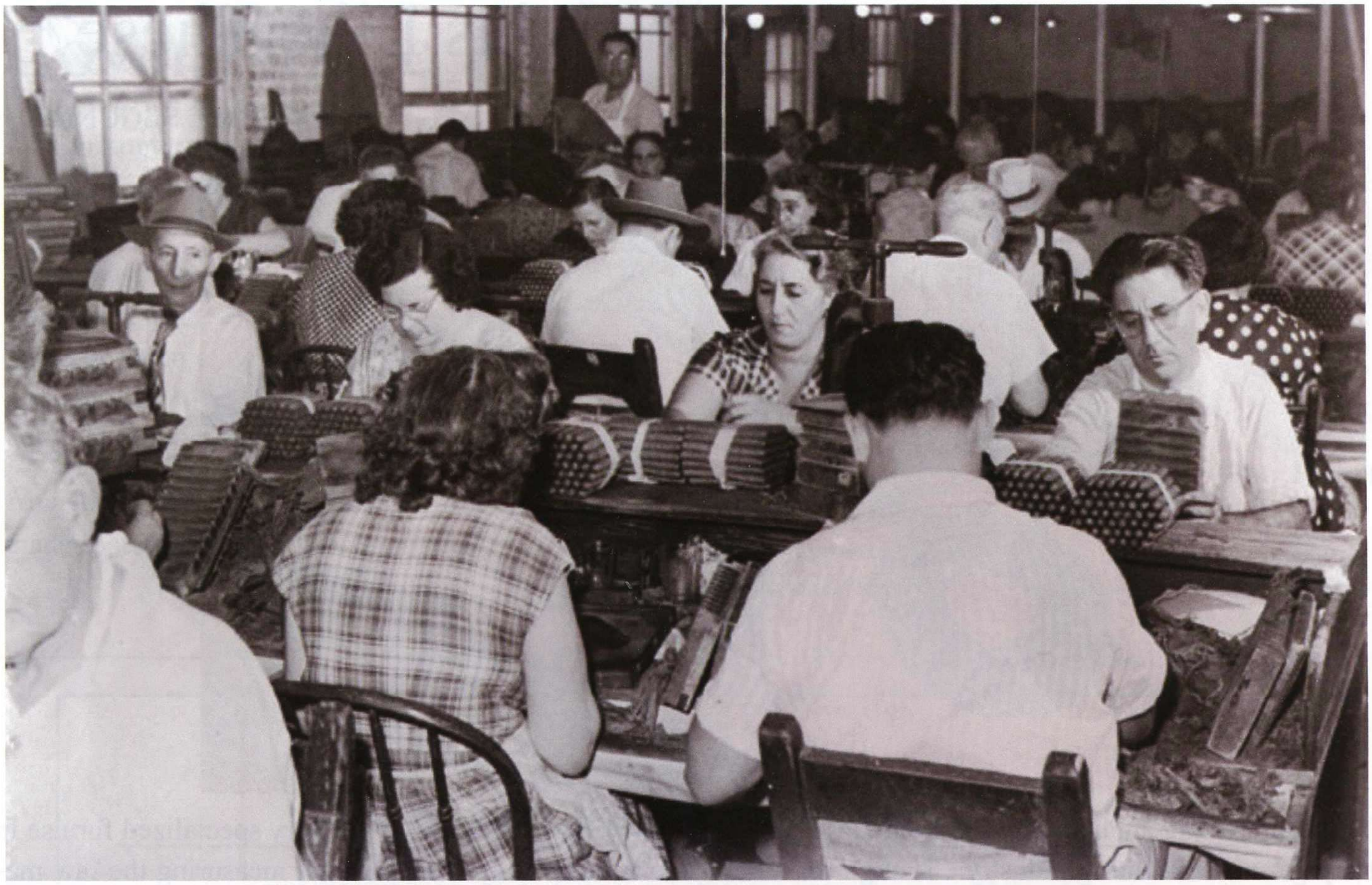
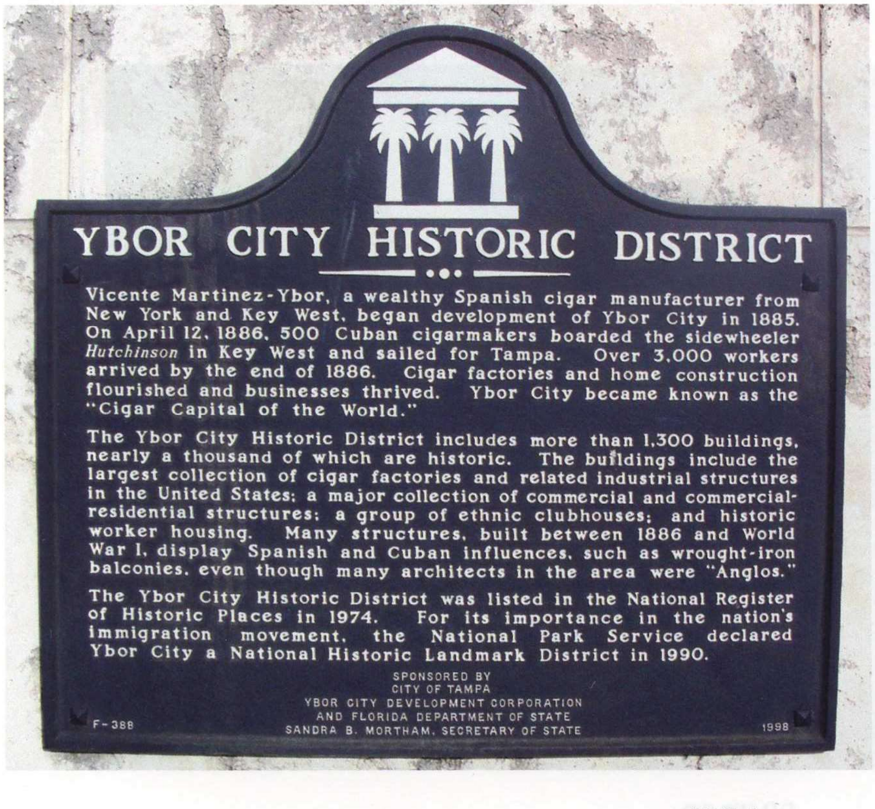


Figure 2. ⮝⮝



Interestingly, when most people think of cigars, they think of Cuba or the Dominican Republic. More than a century ago, a man named Vicente Ybor moved his cigar operation to Tampa, Florida, where many Cubans had immigrated. There he built a big business, in what came to be known as the *cigar capital of the world*.



YBOR CITY HISTORIC DISTRICT

Vicente Martinez-Ybor, a wealthy Spanish cigar manufacturer from New York and Key West, began development of Ybor City in 1885. On April 12, 1886, 500 Cuban cigarmakers boarded the sidewheeler *Hutchinson* in Key West and sailed for Tampa. Over 3,000 workers arrived by the end of 1886. Cigar factories and home construction flourished and businesses thrived. Ybor City became known as the "Cigar Capital of the World."

The Ybor City Historic District includes more than 1,300 buildings, nearly a thousand of which are historic. The buildings include the largest collection of cigar factories and related industrial structures in the United States; a major collection of commercial and commercial-residential structures; a group of ethnic clubhouses; and historic worker housing. Many structures, built between 1886 and World War I, display Spanish and Cuban influences, such as wrought-iron balconies, even though many architects in the area were "Anglos."

The Ybor City Historic District was listed in the National Register of Historic Places in 1974. For its importance in the nation's immigration movement, the National Park Service declared Ybor City a National Historic Landmark District in 1990.

SPONSORED BY
CITY OF TAMPA
YBOR CITY DEVELOPMENT CORPORATION
AND FLORIDA DEPARTMENT OF STATE
SANDRA B. MORTHAM, SECRETARY OF STATE

F-388

1998

To keep the workers entertained in the days before radio and other modern amenities, the factory owners actually hired readers, known in Spanish as "lectores," to read everything from newspaper current events to novels to both engage and educate the people doing an otherwise very repetitive job. As the workers were relatively low paid, it was not uncommon for some to spirit away some wrapper leaves and filler tobacco to "roll their own" at home. Hence the weights shown may also have been used to keep the tobacco parceled out to each employee from not literally walking out the door!

These particular weights represent different varieties/sizes of the "Phillies" brand of cigars, including Perfectos, Double Perfectos, Directors, Royals, Kings, and Imperials. Phillies are now a division of the large Spanish company, Altadis. The date of manufacture and exact use is unknown. They are thought to be unique and currently reside in a private collection in Florida, where the current owner acquired them from another longtime member of the International Society of Antique Scale Collectors. Anyone with further information on this subject is encouraged to leave a response or contact the Society.

Notes & Queries No. 162—Unique Weights

I recently acquired the weights shown in figures 1 & 2. The five weights are brass and are marked as follows: The largest is marked AVERY Ld , (which dates the set either late 19th or early 20th century after Avery became a limited liability company), 112 lb and a "505" near the bottom. The remaining 4 weights are marked 56, 28, 14 and 7 lbs respectively with all having a "505" on the bottom of the diamond shaped weight. They range in size from a little over 2" in length for the largest to just under 1" for the smallest.

Figure 2 shows the reverse with all of the adjustments to make them exactly 1/505 of the weight marked on the face.

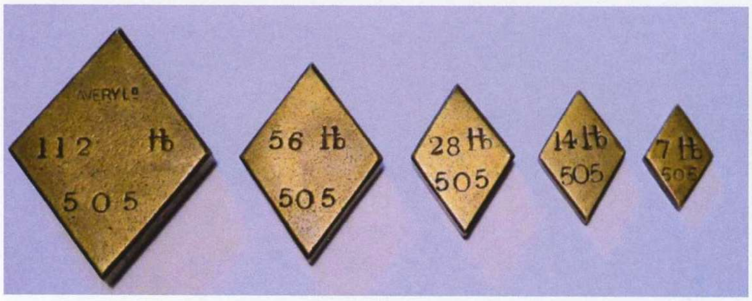


Figure 1.

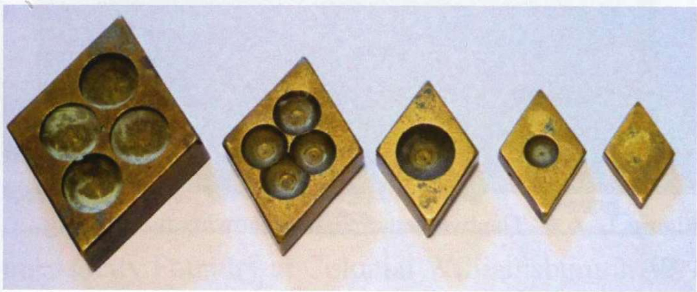


Figure 2.

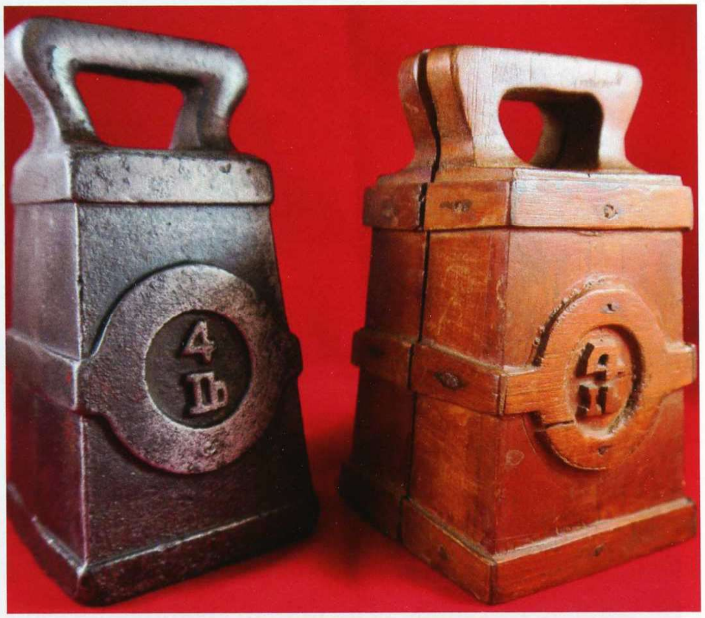
My first thought was that the 1/505 ratio was used to represent some acceptable tolerance used either by inspectors or in a weight manufacturing facility. I spoke with John Cheeseman, "the go to man for all things inspecting" in the UK and he indicated that the tolerances for both inspectors' standard weights and the inspected weights was in the range of about 10-100 times smaller than the indicated tolerances from these. If anyone has more information please contact the editor or Kurt Beyreis.

From Kurt Beyreis

Making Cast Iron Weights

BY STEPHEN BARNETT

Founders started making scale weights out of iron as early as 1599, when *the Founder's company issued instructions regarding iron weights*[1]. Did you ever wonder how cast iron scale weights were made? Frankly, I never gave it much thought until I acquired a wooden pattern[2] for casting a four pound iron weight and wondered how it was used to make the weight. At the same time, I also, acquired a weight which was made from the pattern or a similar one and shows the result of the casting process (Figure 1). This square bell weight is *the pattern made by W&T Avery Ltd, early 20th C.* and was used with Roberval scales[3].



Figures 1 & 4. ▲▲ The weight and its pattern. This side view shows the nailed strips added to the pattern.

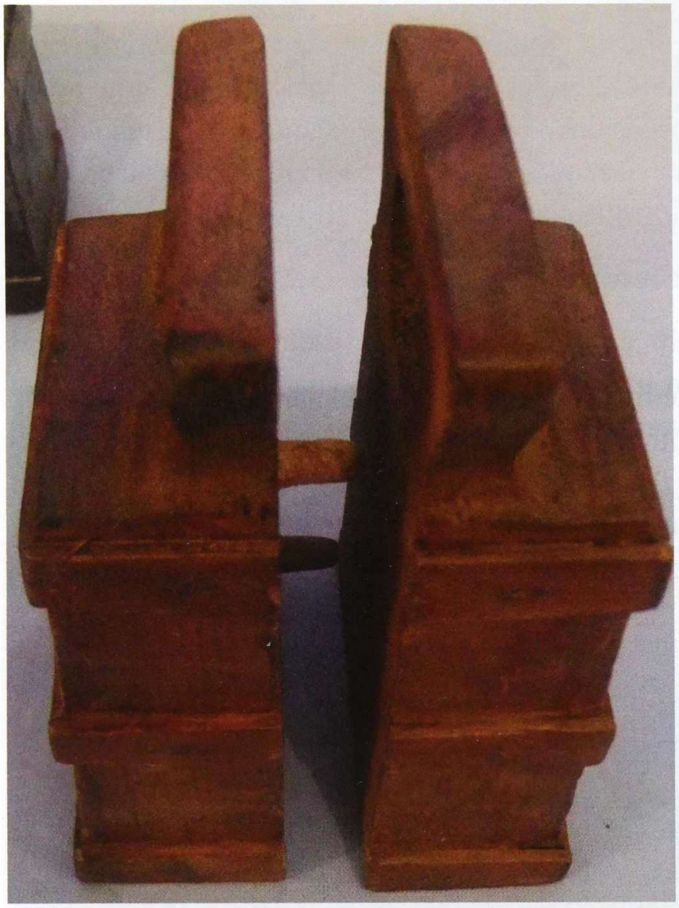


Figure 2. ▲▲ The two pattern halves showing the aligning pegs.

The pattern is in two halves with dowels projecting from the back of one half and corresponding holes in the back of the other half to line the two up when they are put together (Figure 2). The body of each half is shaped from a block of wood, which is smooth, tight grained hardwood, possibly walnut, boxwood, ironwood, mahogany, poplar or a fruitwood such as apple or pear. The handles are carved in it. (Figure 3) The bands at the top, middle and bottom of each half are made from strips of the same kind of wood and are held in place by small nails. (Figures 4 and 5) The weight size, in this case "4 lb", is raised relief carved on the front block.

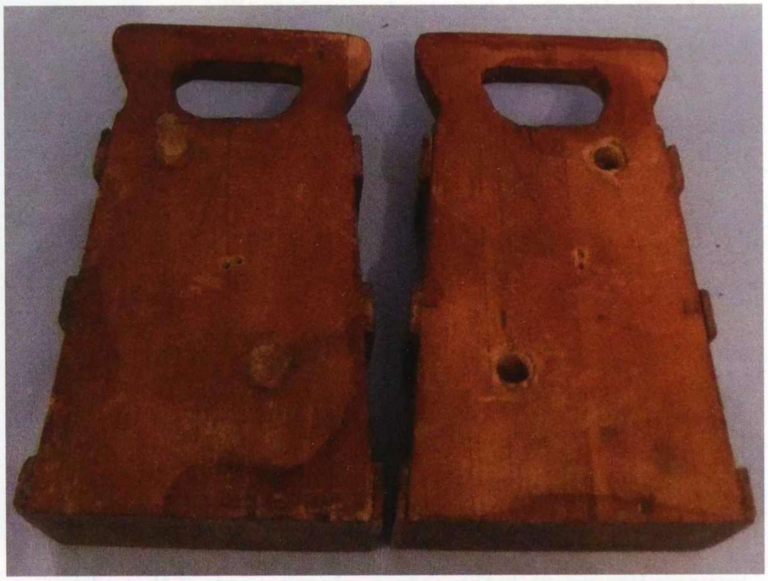


Figure 3. ➤➤ The inside of the two halves showing how the handle is incorporated into the two pattern pieces.

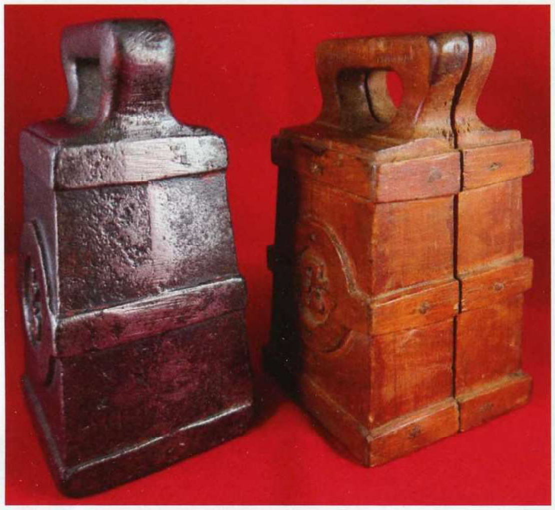


Figure 5. ▲▲ The other side of the weight and pattern.

The pattern was used to form an impression in a sand mold into which molten iron was poured to form the weight. The pattern is made to be slightly bigger than the end product to allow for contraction of the molten metal as it cools. Pattern makers know how much bigger to make the pattern so that when the molten metal cools and contracts the object is the correct size and weight. There is a formula for converting the size of the pattern to the size of the cast weight based on the weight of the pattern compared to the weight of the cast product made from it. The sand mold is used only once because it is damaged or destroyed as the weight is removed from it. The sand in the mold is crumbled and reused in another mold. The pattern is used over and over to make more molds.

Wikipedia[4] describes the metal casting process as follows:

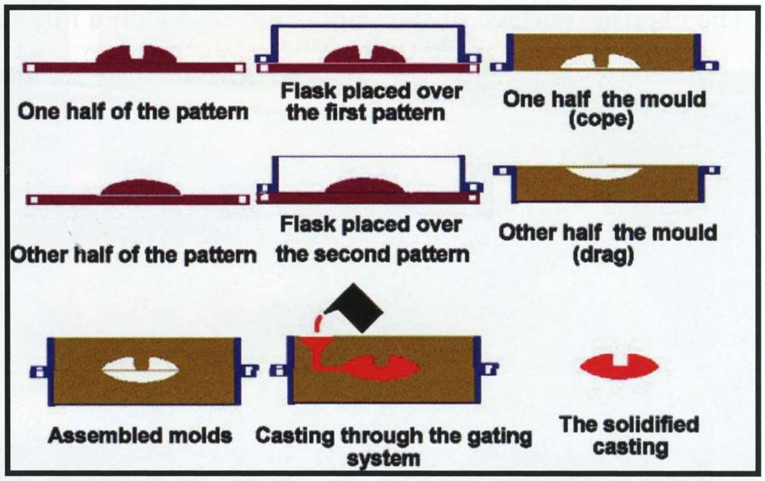
Sand casting*, also known as* ***sand molded casting****, is a metal casting process characterized by using sand as the mold material. The term "sand casting" can also refer to an object produced via the sand casting process. Sand castings are produced in specialized factories called foundries. Over 70% of all metal castings are produced via sand casting process.*

Sand casting is relatively cheap and sufficiently refractory even for steel foundry use. In addition to the sand, a suitable bonding agent (usually clay) is mixed or occurs with the sand. The mixture is moistened, typically with water, but sometimes with other substances, to develop the strength and plasticity of the clay and to make the aggregate suitable for molding. The sand is typically contained in a system of frames or mold boxes known as a flask. The mold cavities and gate system are created by compacting the sand around models, or patterns, or carved directly into the sand.

There are six steps in this process:

1. *Place a pattern in sand to create a mold.*
2. *Incorporate the pattern and sand in a gating system.*
3. *Remove the pattern.*
4. *Fill the mold cavity with molten metal.*
5. *Allow the metal to cool.*
6. *Break away the sand mold and remove the casting.*

It includes an illustration of the process:


One half of the pattern
Flask placed over the first pattern
One half the mould (cope)
Other half of the pattern
Flask placed over the second pattern
Other half the mould (drag)
Assembled molds
Casting through the gating system
The solidified casting

To learn more about the casting process, we visited the James Getty Foundry at Colonial Williamsburg in Virginia recently. The Journeyman Founder, Michael Noftsger, and his assistants, Sue and Jack, explained how our wood pattern was used to make the sand mold in which the iron weight was cast. We watched, and took pictures, as they assembled already prepared sand molds, melted silver and poured it into the molds. They answered our questions about the process and the tools and raw materials that are used to make the molds and to cast the metal in them. Although they cast brass, bronze, silver or pewter items, the process used to cast iron items, like scale weights, is the same. It is also the process used to cast brass parts of scales, and brass and bronze weights.

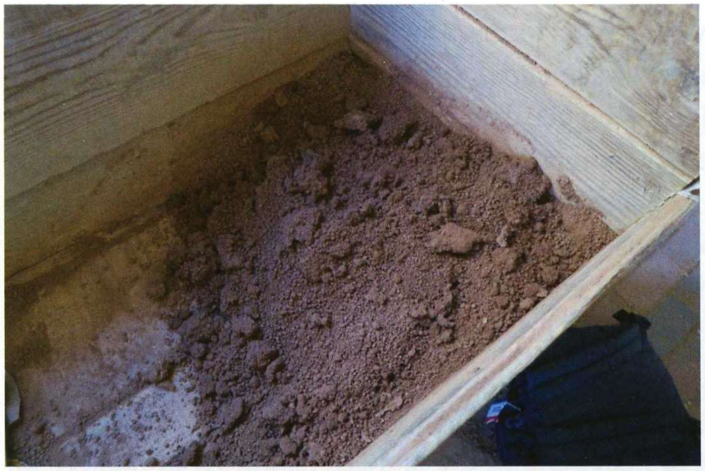


Figure 6. ▲▲ The sand used to make sand castings.

The process starts with making the sand casting from the pattern. The sand casting is made with moist 300 grit riverbed sand mixed, in a two to one ratio, with clay as a bonding agent. (Figure 6 shows what the dry sand and clay mixture looks like.) The half of the weight pattern that does not contain the pegs is placed on a flat, smooth iron slab. One part of the iron flask (Figure 7) is placed around the pattern. The sand mixture is packed to fill the flask around the pattern using special tools to press it into place. Figure 8 shows three of the tools used (packer, rammer (weighted with lead) and hammer). They are resting on an iron slab like the ones that are used to build the sand casting. The pattern creates an impression of the front and sides of the pattern in the sand mixture that is packed around it. It is the same idea as leaving a shoe print in mud, only in this case the sand is packed around the pattern rather than the pattern being pressed into it. Once the flask is filled with the sand mixture, it is turned over and the other half of the pattern is put over the first half using the dowels to line the two halves up. The exposed surface of the sand is covered with a mixture of talc and charcoal. The other half of the flask is placed on top, and sand is packed in it and around the second half of the pattern.

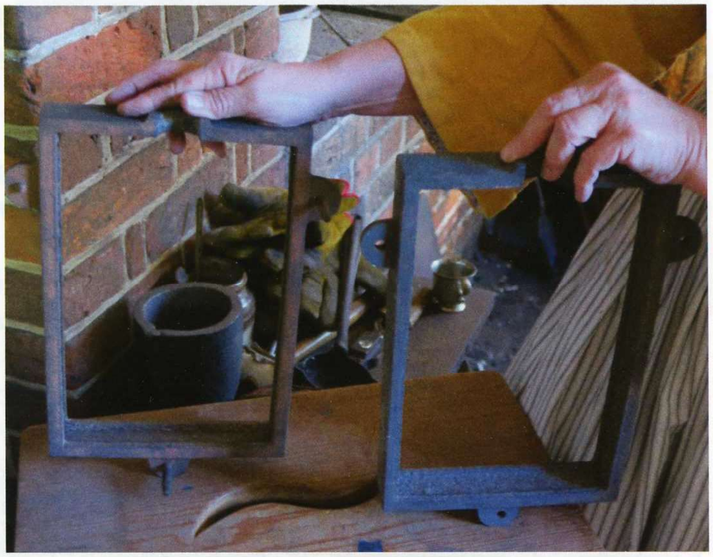


Figure 7. ▲▲ Examples of flasks used to make sand molds.

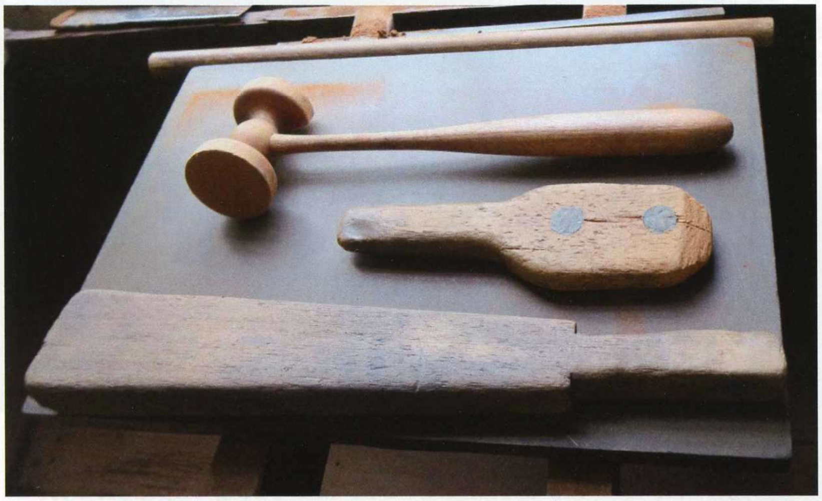


Figure 8. ▲▲ Tools used to pack the sand around the pattern.

Once the sand mixture in both halves is dry and hard, the two flasks are separated and the two halves of the pattern are removed leaving a void with the impression of the outsides of the pattern. Finally, channels are carved into the sand to allow the molten iron to flow from the point where it is poured into the mold to the void in which it solidifies to form the weight. (Figure 9 shows half of a sand mold with channels carved into it that was used to cast the variety of small brass decorative items shown in the picture.) The two halves of the sand mold are covered in a mixture of talc and charcoal dust to improve the seal between them when they are assembled, and to make it possible to separate them once the cast items are solid enough to be removed. They are put together and then held in place in a large iron frame so that the molten metal can be easily and safely poured into them. (Figure 10)

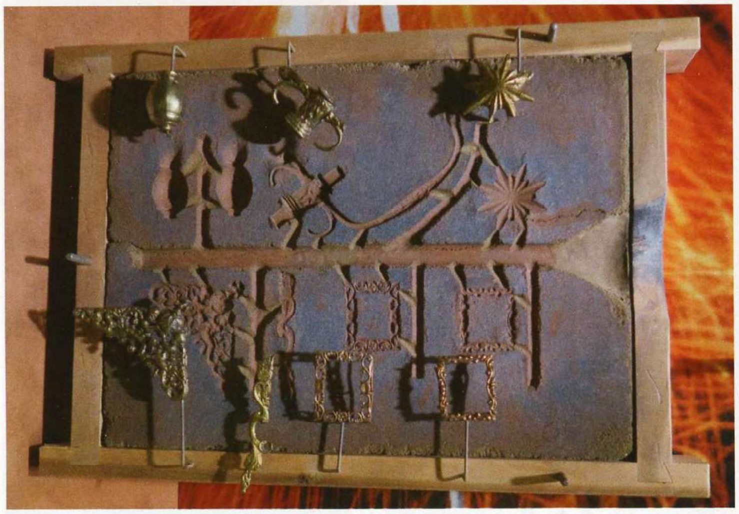


Figure 9. Example of a sand mold on display at the Art Museum in Colonial Williamsburg.

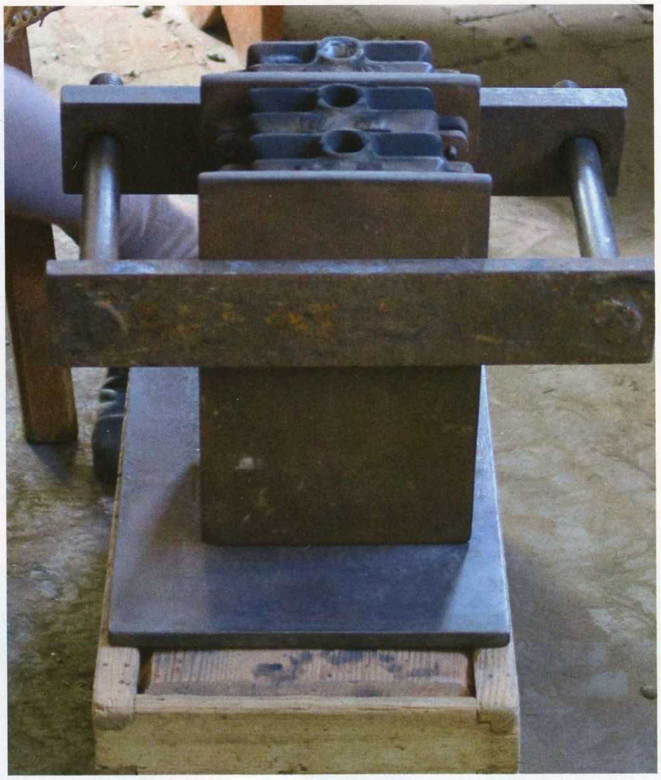


Figure 10. Sand molds in iron frame ready to receive the molten metal.

The next step is to melt the metal. Pieces of the metal, perhaps cut from an ingot or scrap from a previous casting, are placed in a suitably sized clay and graphite crucible (Figure 11 shows various sized crucibles.). The crucible is covered and placed in a fire pit on top of burning charcoal and anthracite coal. Additional coal and charcoal are placed around the crucible. A large bellows fans the fire to a very hot temperature. (Figure 12) The founder adds more coal as it is needed.

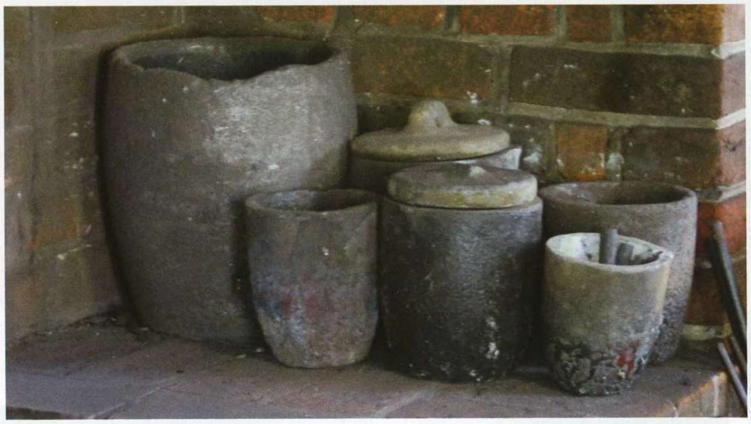


Figure 11. Crucibles used in the casting process.

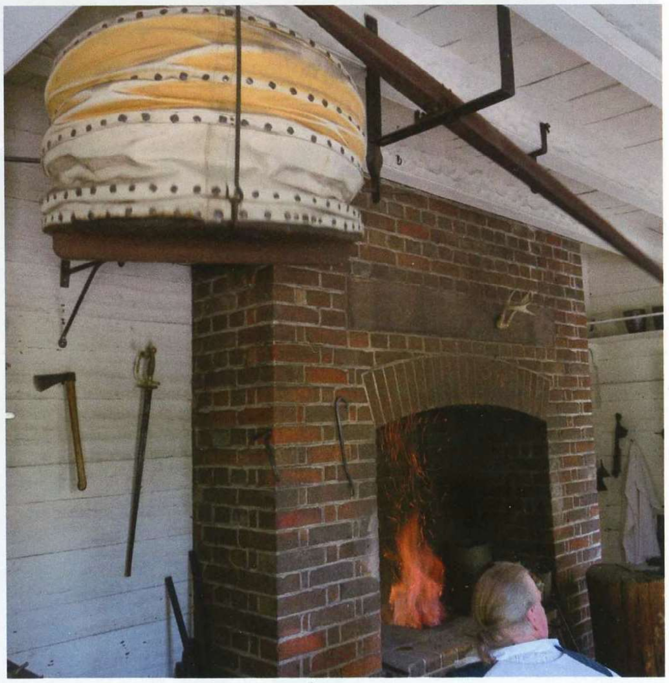


Figure 12. Bellows used to fan the fire.

Each metal has two critical temperatures, its melting temperature and its pouring temperature, which is much higher. Pewter has the lowest pouring temperature, iron has the highest. Brass, bronze and silver are between them. Once the metal reaches pouring temperature, which can take several hours depending upon the metal and the amount in the crucible, the red hot glowing crucible is removed from the fire pit, (Fig 13) uncovered, and using large tongs, the founder carefully pours the molten metal into the sand molds (Fig 14). The pouring temperature ensures that the molten metal will not solidify until it has filled all of the voids in the sand mold. The founder judges the temperature of the molten metal from its appearance. Silver is not only liquid but reflects like a mirror when it has reached pouring temperature. After several more hours, depending upon the metal and the size of the item being cast, the sand molds are removed from the frame, and the two halves of it are separated revealing the cast item. (Fig 15)

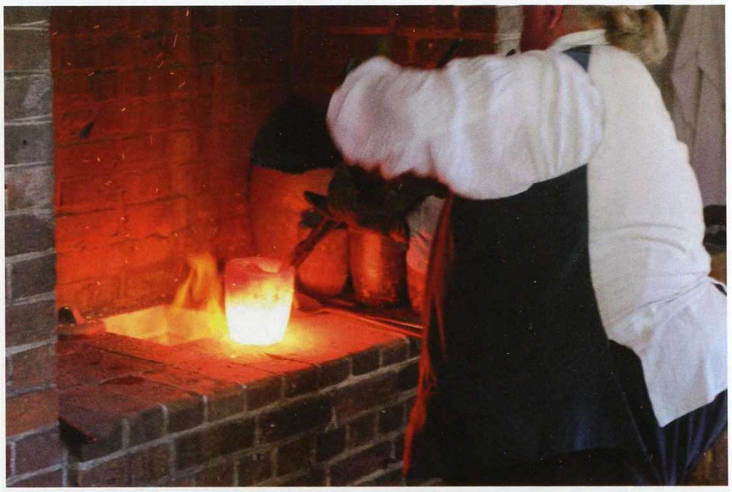


Figure 13. ⩓⩓ Removing the crucible from the fire.

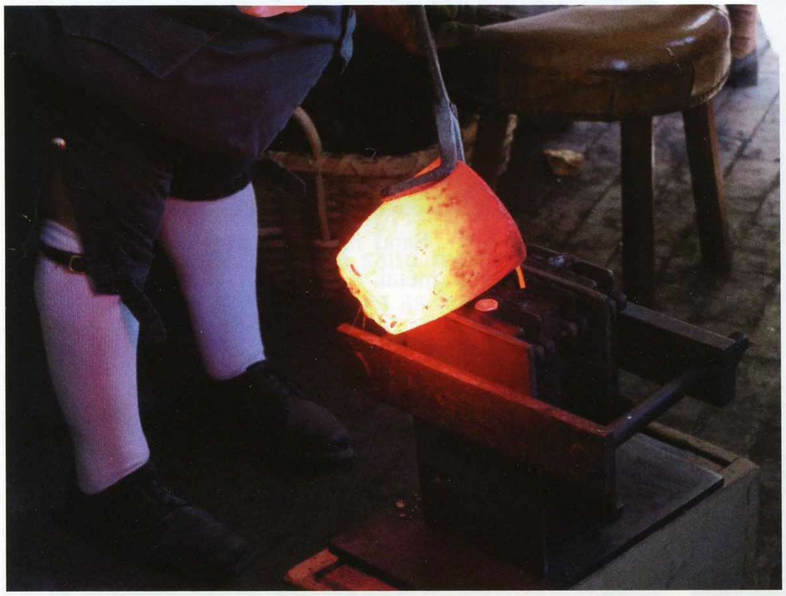


Figure 14. ⩓⩓ Pouring the molten metal into the mold.

The final step is removing excess metal from the item, and for brass, pewter, silver or bronze items, polishing them to the intended brilliance. The excess metal is the result of the molten metal oozing out of the void between the two halves of the sand mold. Fig 16 shows cast silver handles for a bowl, one fresh out of the mold with the excess metal attached to it, and one with the excess filed off of it and polished. This finishing step can be the most time and labor intensive, and requires using files, and polishing with successively finer grades of polishing material (emery paper, pumice, tripoli and finally rouge).

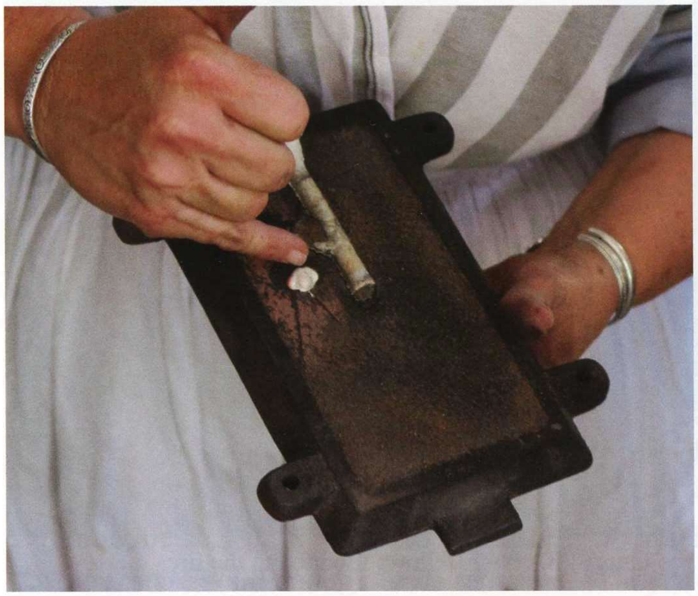


Figure 15. ⩓⩓ The opened mold; sometimes it does not produce a successful casting.

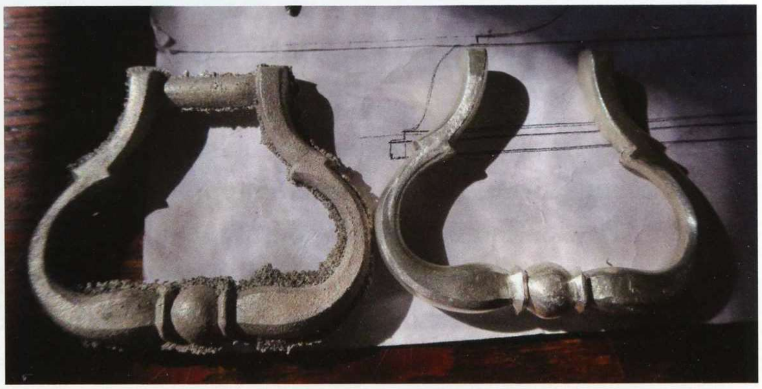


Figure 16. ⩓⩓ Cast silver handles before (left) and after finishing.

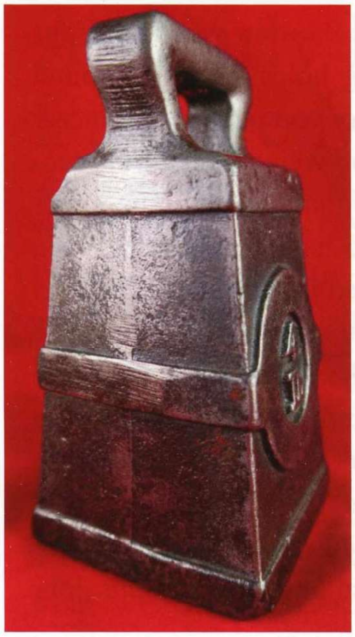


Figure 17. ᐱᐱ The side of the weight showing what looks like a weld seam.

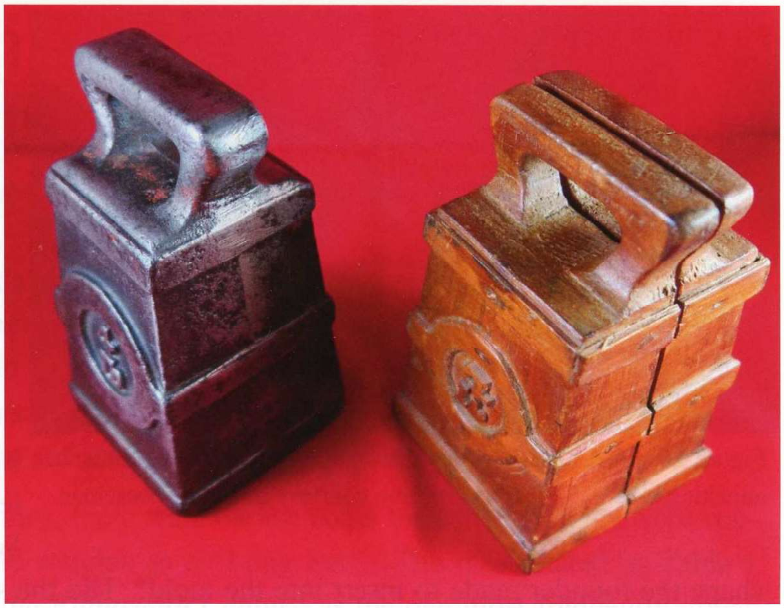


Figure 18. ᐱᐱ A top view of the weight and pattern; note no seam line in the handle of the weight.

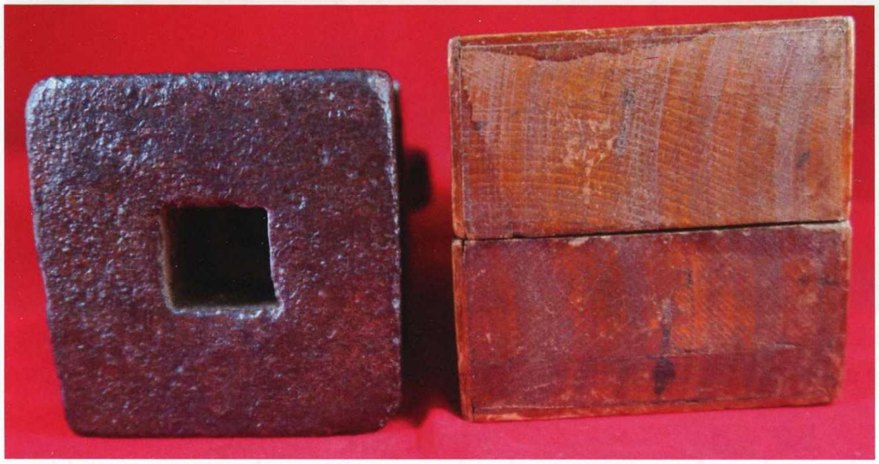


Figure 19. ᐱᐱ The bottom of the weight and the pattern; note no seam line on the bottom of the weight.

I've noticed what appears to be a line down each side of the weight which I thought was a seam resulting from the weight being cast in two pieces which were then welded together. (Figure 17) That is not correct. When the iron is cooled and removed from the mold, the excess iron which leaks between the two halves of the mold is filed or ground off. The result can create an apparent seam. There is no such "seam" visible on the handle or on the bottom of the weight. (Figure 18 and 19)

As shown in Figure 19, this pattern does not contain a square or round cut out section in the bottom to create a round or rectangular shaped hole in the bottom of the cast weight. The hole in the weight is there to contain the adjusting lead needed to make the weight exactly four pounds, so that it could be verified as being of correct weight. The adjusting hole could be rectangular or round, either of which was allowed by the Weights and Measures Act of 1907 for this style of weight. The act specified the size of the hole.[5] John Cheeseman pointed out that the holes were cut so that the hole was bigger inside the weight than at the edge so that the lead that filled the hole to adjust the weight could not slip out. Once the inspector determined how much the cast weight was below true weight, a lead slug of the appropriate weight was inserted into the hole and then using a tool, such as those in Figures 20 and 21, the slug was rammed into the hole. Since lead is a soft metal, it fitted the shape of the hole and could not fall out or be removed. The exposed surface of the lead was smooth and ready to have the verification marks stamped into it. As I now understand the casting process, for a weight made from a single mold, the adjusting hole was either drilled, or drilled and squared off with a chisel. The pattern could also be used to cast weights that were not required to be adjusted.

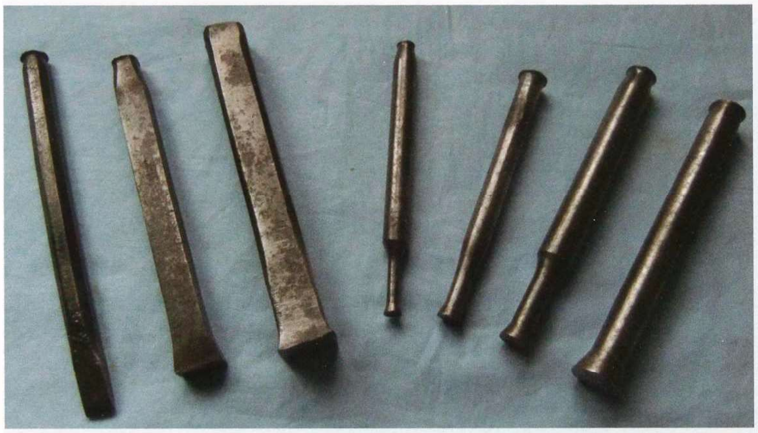


Figure 20. ▲▲ Tools to set the lead adjusting weight into the adjusting hole. Photo courtesy of John Cheeseman.

My wife and I examined the iron weights in our collection. The adjusting holes are either round for smaller size weights, or rectangular[6] for larger size weights. One 7 pound weight had a truly rectangular hole in the bottom of it. The other weights above one pound had square holes. We wondered what determined the shape of the hole. Was it dependent upon the region in which the weight was verified and the shape of the stamp for the verification mark (round or rectangular)? Was it because it is easier to get the correct amount of lead in a rectangular hole to adjust the weight? Was it random, determined by which ever core shape the founder made to insert into the mold? Did the size of the weight and ease of drilling or chiseling the hole determine the shape of the hole? Or, was it more basic in that the founders had a way of creating the adjusting hole in the mold, and round holes could be more reliably cast in the smaller weights?

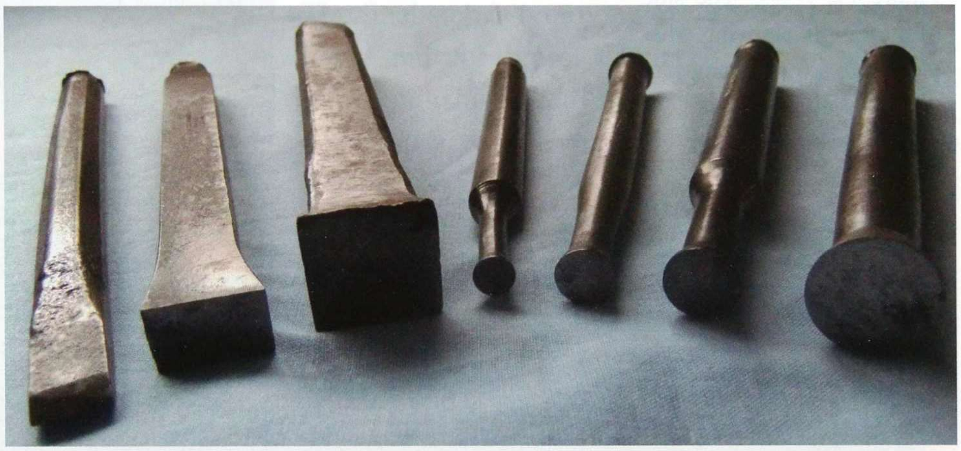


Figure 21. ▲▲ The face of the tools used to set the lead weight and create a smooth surface prior to getting the verification mark. Photo courtesy of John Cheeseman.

Starting with a description of the pattern used for casting iron scale weights, I've explained their function in the casting process. Finally, I've offered ideas for the reasons that adjusting holes in larger iron weights are predominantly rectangular rather than round, as they are in brass weights and smaller iron weights. For the reader who is interested in learning more about iron weights used in Britain, Michael Crawforth's series of articles provides a lot of information about iron weights, who made them, their shapes and types, the weights and measures acts that governed their design and construction, and how to care for them[7].

Acknowledgements:

I would like to acknowledge John Cheeseman, and Michael Noftsger and his associates at the Getty Foundry at Colonial Williamsburg for their contributions to this article. John provided the pattern and the weight that started this project, and information and pictures about verifying weights. Michael and the others at the Getty Foundry provided a lot of information about, and a chance to see and photograph the process of casting metal objects.

Notes & References:

1. Crawforth, Michael, *Iron Weights in Britain Part 1, Equlibrium* 1983- Issue 3 pp 581-588.
2. One of the first things that I learned was that the technical term for this is "pattern"; the mold contains the cavity shaped by the pattern into which the molten metal is poured to create the object.
3. Crawforth, Michael, *Iron Weights in Britain Part 2, Equlibrium* 1983- Issue 4, Figure 36 and notes on pg. 616.
4. https://en.wikipedia.org/wiki/Sand_casting
5. Crawforth, Michael, *Iron Weights in Britain Part 2, Equlibrium* 1983- Issue 4 page 614.
6. Most are square, i.e. rectangles with equal length sides.
7. Crawforth, Michael, *Iron Weights in Britain Part 3, Equlibrium* 1984- Issue 1 pp 633-639.

An Early Multi-Coin English Rocker Balance Maker – C. Pinchbeck

BY MICHAEL FOSTER

An early Multi-Coin English Rocker Balance maker was Christopher Pinchbeck, Junior, jeweller, toy and clock maker, inventor and mechanician of London in the late 1700s.

Portuguese gold was in general circulation in England in addition to British Mint gold coinage (the Guinea and its fractions) officially up to the Great Recoinage Law of 1816. This was because of the large amount of trade with Portugal after England's trade treaty in 1703 and the customary acceptance of the Portuguese gold coins (the Johannes and Moidore and their fractions) in payment. Portuguese gold more or less disappeared in England after about 1780 when there were sufficient newly minted guineas in circulation.

After 1762, with the introduction of the quarter guinea, there were eleven coins for which weights were conventionally supplied. Collectors today refer to the weights as a "Long Set". The mass stated in Table 1 from Norman Biggs, *Provincial Coin Weights in the Eighteenth Century*, is the one most frequently given, but there was no official standard for most of the Portuguese pieces.

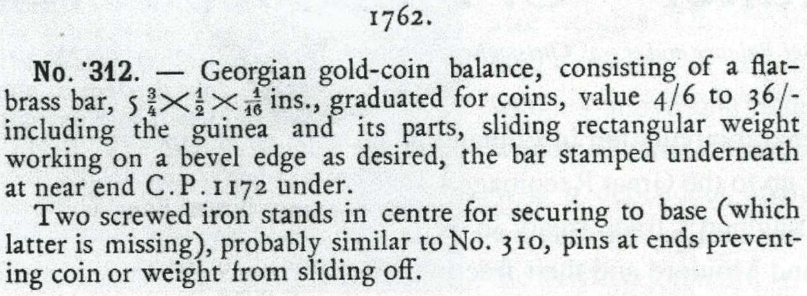
Table 1: Mass of British and Portuguese Coins

Name	*Value*	*Customary Mass*
Double johannes	£3 12*s.*	18dwt 10gr
Johannes	36*s.*	9dwt 5gr
Moidore	27*s.*	6dwt 22gr
Guinea	21*s.*	5dwt 9gr
Half johannes	18*s.*	4dwt 14gr
Half moidore	13*s.* 6*d.*	3dwt 11gr
Half guinea	10*s.* 6*d.*	2dwt 16gr
Quarter johannes	9*s.*	2dwt 7gr
Quarter moidore	6*s.* 9*d.*	1dwt 17gr
Quarter guinea	5*s.* 3*d.*	1dwt 8gr
Eighth johannes	4*s.* 6*d.*	1dwt 3gr

Particularly in the West Country parts of Britain, Portuguese gold almost completely displaced the insufficient coinage of guineas from the Royal Mint. The most numerous of these were the moidore valued at 27 Shillings for a weight of 6 dwt 22 grains, and the half-moidore at 13 Shillings and 6 pence for a weight of 3 dwt 11 grains. In 1742, the moidores of Portugal were described by Rev. Peter Vallavine, vicar of Monkton, England as being *in great measure the current coin of the Kingdom*.

As the Portuguese coins began to wear and become clipped in general circulation the need for the "Long Set" of coin weights or some other means to test the coins became apparent. A London based jeweller, toy and clock maker and mechanician of the time Christopher Pinchbeck responded to the need with a multi-coin rocker balance with sliding poise, that he named the "Tycho Brahe Coin Balance" after the Danish astronomer, Tycho Brahe, 1546–1601, who designed and constructed instruments that he used to plot accurately the positions of the planets, sun, moon, and stars.

Pinchbeck's Tycho Brahe Coin Balance is described in Sheppard and Musham, No. 312. Although they didn't know who the maker was, they listed it as circa 1762 because it tested the quarter guinea (5/3):



1762.

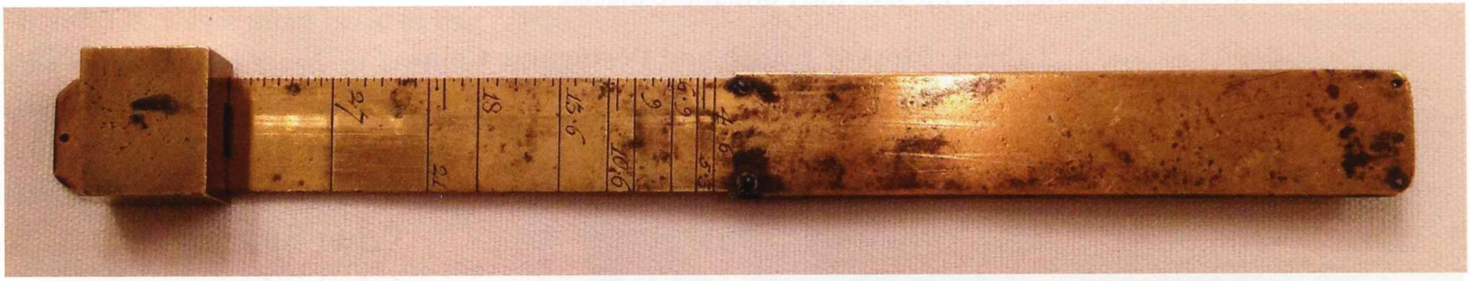
No. 312. — Georgian gold-coin balance, consisting of a flat-brass bar, $5\frac{3}{4} \times \frac{1}{2} \times \frac{1}{16}$ ins., graduated for coins, value 4/6 to 36/- including the guinea and its parts, sliding rectangular weight working on a bevel edge as desired, the bar stamped underneath at near end C.P. 1172 under.

Two screwed iron stands in centre for securing to base (which latter is missing), probably similar to No. 310, pins at ends preventing coin or weight from sliding off.

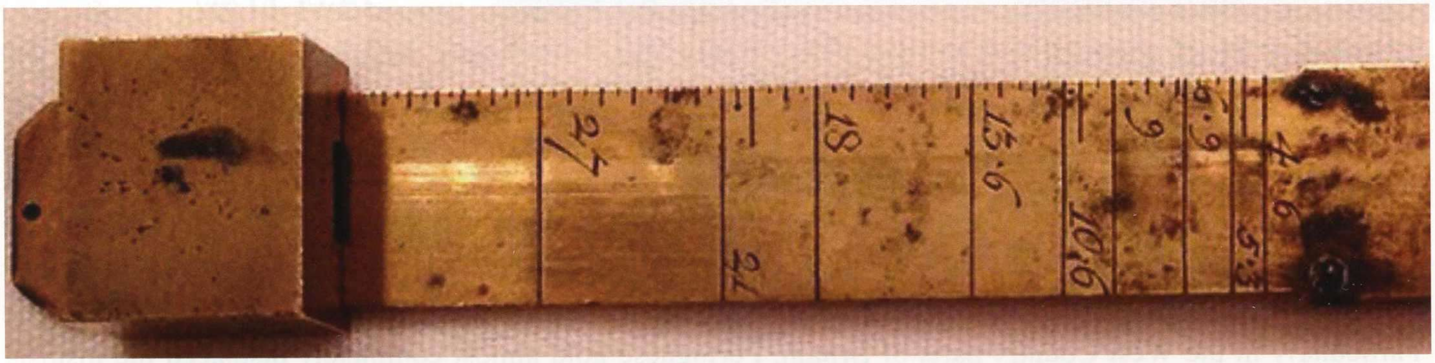
Sheppard and Musham, No: 312, p.155

The author knows of two other examples of the Georgian gold-coin balance described above. In a private collection is a balance labelled with CP and numbered 1084 on the underside of the beam:

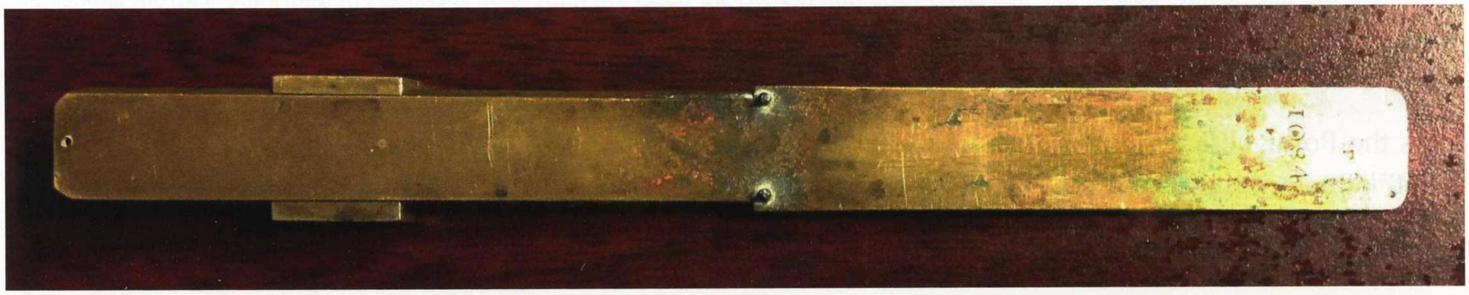
Top: Tycho Brahe Coin Balance



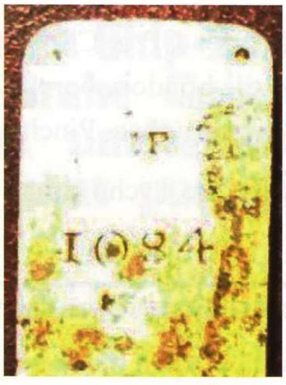
Pinchbeck's Tycho Brahe Coin Balance had markings to test for coin values from 4/6 to 36/-, the complete "Long Set" in Table 1, except for the Double Johannes.



Tycho Brahe Markings from 4/6 to 36/-



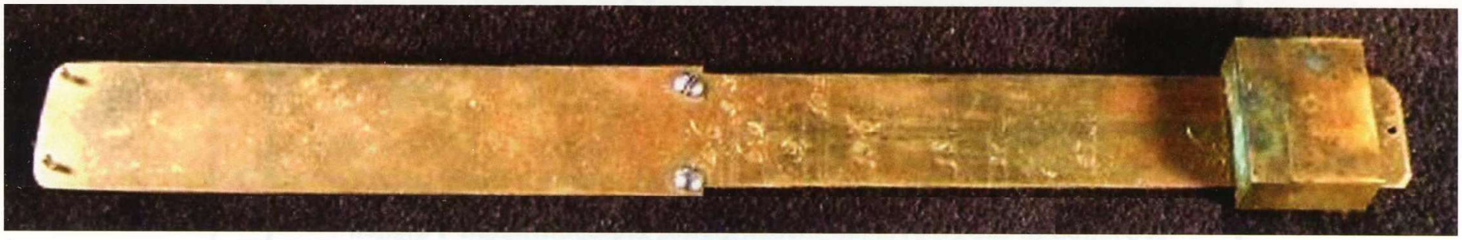
Bottom: Tycho Brahe Coin Balance



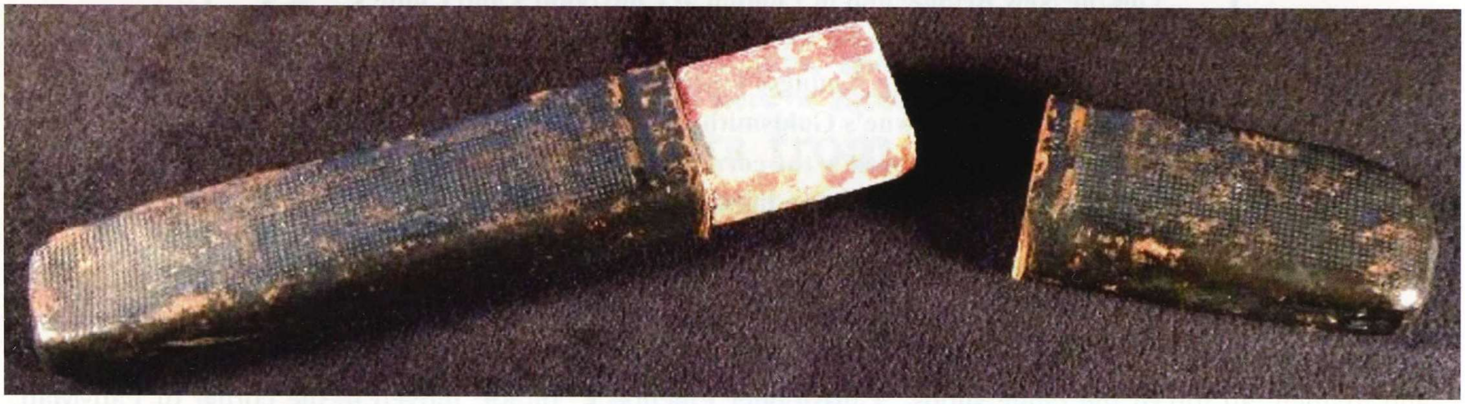
CP 1084 underneath

Dimensions: Overall length: 147 mm. Width at poise: 13 mm.
Width at platter: 14 mm.
Poise length: 14 mm. Poise width: 16 mm. Poise height: 8 mm.

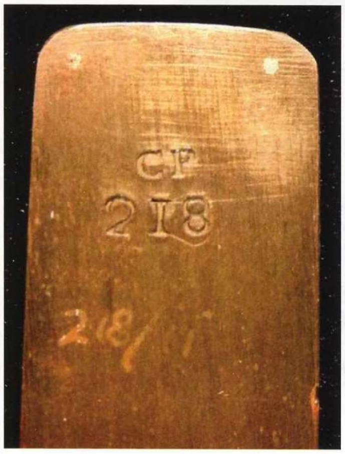
A second example with box, this one also labelled with CP but numbered 218 underneath:



Top: Tycho Brahe Coin Balance



Box: Tycho Brahe Coin Balance



CP 218 underneath

Sheppard and Musham assumed that their example was missing a base, but that appears to be a bad assumption. None of the three recorded examples (CP 218, CP 1084 and CP 1172) have a base. The "two screwed iron stands in centre" were all the pivot point the balance needed to work. They could be replaced if worn or damaged.

From the *Crawforth Index,* the best candidate for CP is Christopher Pinchbeck, Junior, jeweller and clock maker, Cockspur St. at the corner of Pall-Mall, London, born 1710, died about 1783. Given that the scale was manufactured after 1762 and tests the quarter guinea, Pinchbeck was the most likely maker candidate.

The text from a Bath Advertisement in 1773 for the Tycho Brahe pocket coin balance, to check the weight of currency:

THE TYCHO BRAHE COIN BALANCE

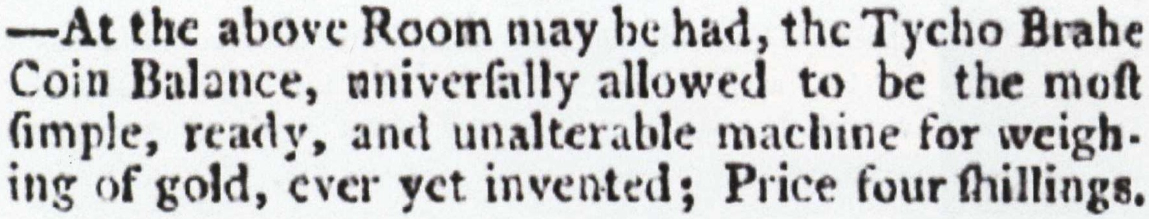
(price only 4s in cases) which, upon the most simple principles of that Great Philosopher, is from its expedition, necessary accuracy to prevent taking light money, cheapness, and the almost impossibility of being put out of order, universally esteem'd as the most desirable pocket machine for the purpose of determining the currency of every piece of gold coin from 4s. 6d to a 36s piece, of any yet offer'd to the public, and even to most of the present scales and weights from the difficulty of getting perfect ones, and from their being so subject to be injured (particularly when carry'd in the pocket.)

This very ready and useful machine, which will determine 20 or so of any of the above pieces of coin in a minute, with printed descriptions, are to be had in Bath at Mr. Bull's Library and Toyshop in the Grove, and Mess. Evills, Goldsmith and Toymen in the Market Place; in Bristol of Mr. Naish Goldsmith and Cutler on the New Bridge; and in London at Courtauld's and Coule's Toyshop facing the Royal Exchange, Mr. Deard's Jeweller and Toyman Piccadilly, Mr. Younge, Toyman and Dealer in Coins, No. 81, Fleet St, Mr. Browne's Goldsmith, No. 14 Cheapside, and at Mr Pinchbeck's, the corner of Pall-Mall.

N.B. Some few in Silver and Ivory.

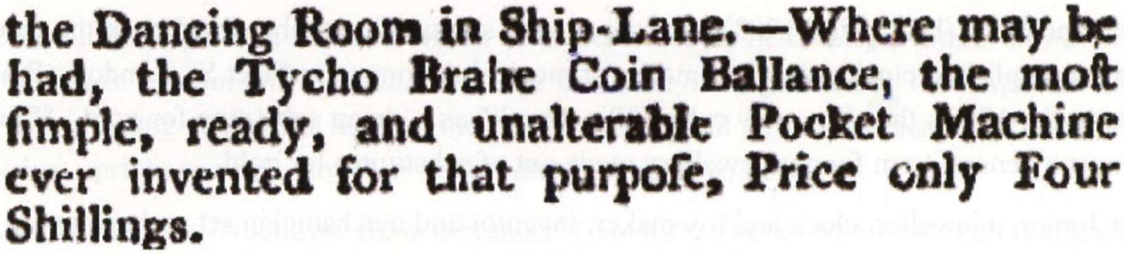
It is interesting to see Mr. Pinchbeck and the others who were selling the Tycho Brahe, goldsmiths, jewellers and toymen, all top of the range shops. Christopher Pinchbeck, Junior, moved to the corner of Pall-Mall, facing the Haymarket in 1746, reference: *The Daily Gazetteer, 11 November, 1746.*

Pinchbeck advertised his Coin Balance in the *Oxford Journal* with the Tycho Brahe name:



—At the above Room may be had, the Tycho Brahe Coin Balance, univerſally allowed to be the moſt ſimple, ready, and unalterable machine for weighing of gold, ever yet invented; Price four ſhillings.

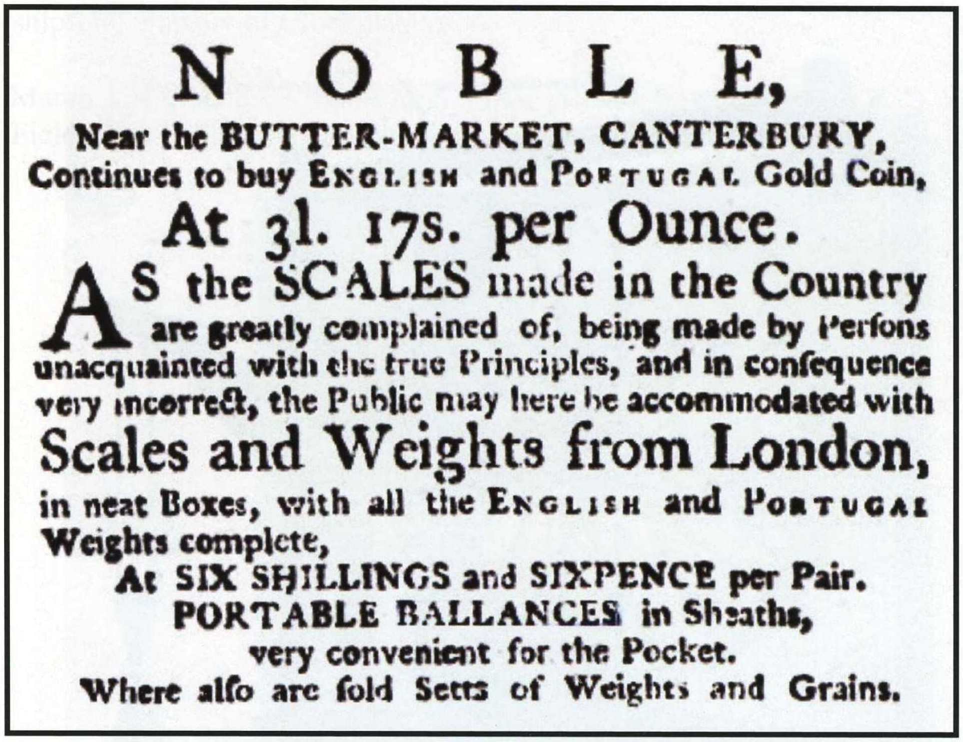
Oxford Journal **— Saturday, 5 March 1774**



the Dancing Room in Ship-Lane.—Where may be had, the Tycho Brahe Coin Ballance, the moſt ſimple, ready, and unalterable Pocket Machine ever invented for that purpoſe, Price only Four Shillings.

Oxford Journal **— Saturday, 19 March 1774**

These advertisements give us a documented year of 1773 that the Tycho Brahe Coin Balance was in production at the Pall-Mall, London shop of C. Pinchbeck. The public now had access to a “Pocket Machine” to test Portuguese and English gold coins instead of needing to carry a balance scale and the “Long Set” of weights, which could be lost or misplaced. All for the price of four shillings! Which was a good deal when compared to “Portable Ballances (sic) in Sheaths” with “English and Portugal Weights Complete” at six shillings and sixpence sold per pair by Noble of Canterbury in the *Kentish Gazette* of 1773.



N O B L E,

Near the BUTTER-MARKET, CANTERBURY,

Continues to buy ENGLISH and PORTUGAL Gold Coin,

At 3l. 17s. per Ounce.

AS the SCALES made in the Country are greatly complained of, being made by Perſons unacquainted with the true Principles, and in conſequence very incorrect, the Public may here be accommodated with

Scales and Weights from London,

in neat Boxes, with all the ENGLISH and PORTUGAL Weights complete,

At SIX SHILLINGS and SIXPENCE per Pair.

PORTABLE BALLANCES in Sheaths,

very convenient for the Pocket.

Where alſo are ſold Setts of Weights and Grains.

Kentish Gazette **– Saturday, 4 September 1773**

Note from this advertisement that English and Portugal Gold Coin was being bought at 3£ 17S per ounce in 1773.

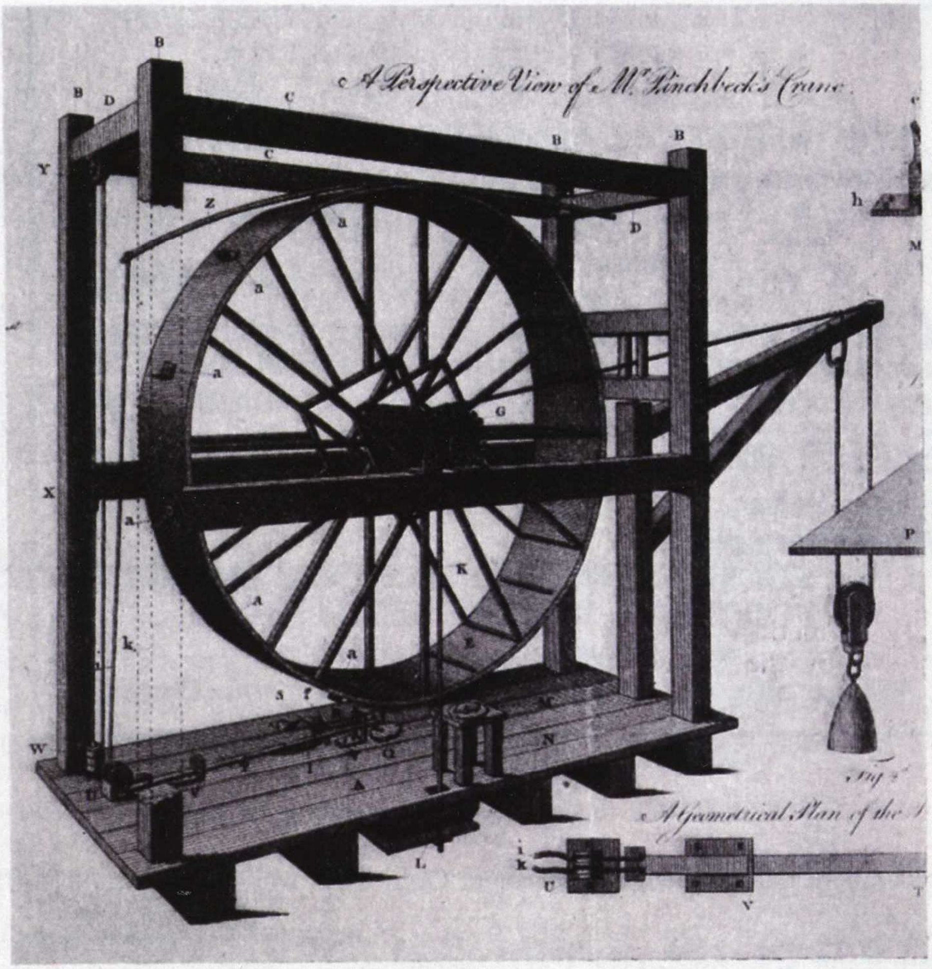
We also know from the Numbered examples that Pinchbeck made over a thousand of these rocker balances for customers. This represents about 200 Guineas worth of balance sales. So who was Christopher Pinchbeck?

Christopher Pinchbeck (b.1710?, d.1783), was the second son of Christopher Pinchbeck the elder (b.c.1670, d.1732), an accomplished clockmaker and maker of musical Automata in Fleet St, London. Pinchbeck Senior invented in the 1700's the alloy now called "Pinchbeck" as a cheap substitute for gold. "Pinchbeck" has become almost a general term for any jewellery made out of substitutes for gold.

Christopher Junior, a jeweller, clock and toy maker, inventor and mechanician set up business in Fleet Street, near his father's old shop, The Musical Clock. In 1747, he moved to nearby Cockspur Street, remaining there until his death.

Pinchbeck possessed great mechanical ingenuity and was a member, and at one time president, of the Smeatonian Society, the precursor of the Society of Engineers, established in May 1854, the third oldest professional engineering body in the UK.

In 1762 he devised a self-acting pneumatic brake for preventing accidents to the men employed in working wheel cranes, for which the Society of Arts awarded him a gold medal in 1767 for his “Safety crane”. (*Trans. Soc. Arts*, iv. 183).


A Perspective View of Mr. Pinchbeck's Crane
A Geometrical Plan of the
Fig 2
B
B
D
C
C
B
B
Y
Z
D
h
M
a
a
a
G
X
P
K
A
E
a
k
W
N
L
V
T

Pinchbeck’s Crane, 1767 : Fitted with Automatic Brake to Prevent Running Back of the Walking Wheel

Pinchbeck’s Safety Crane 1767

Pinchbeck took out three patents, in all of which he is described as of *Cockspur Street in the parish of St. Martin's in the Fields, toyman and mechanician.* The first (No. 892), granted in 1768, was for an improved candlestick, with a spring socket for holding the candle firmly, and an arrangement whereby the candle always occupied an upright position, however the candlestick might be held.

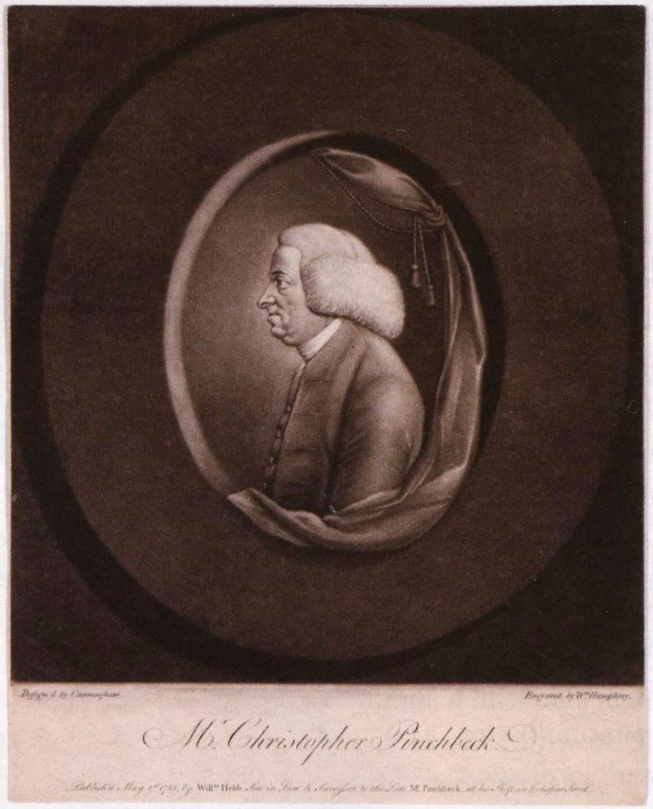
In 1768 he also patented his 'Nocturnal Remembrancer' (No. 899) a series of tablets with notches to serve as guides to facilitate writing in the dark.

His patent snuffers (No. 1119 in 1776) continued to be made in Birmingham until the last forty years or so, when snuffers began to go out of use. The contrivance inspired an 'Ode to Mr. Pinchbeck, upon his newly invented Candle Snuffers' by 'Malcolm MacGreggor' (i.e. William Mason), a fifth edition of which appeared in 1777.

In 1774 he presented to the Society of Arts a model of a plough for mending roads (*Transactions*, i. 312; BAILEY, *Description of Machines*, &c. ii. 21).

He became a friend of, as well as clockmaker by appointment to, King George III. He was an honorary freeman of the Worshipful Company of Clockmakers.

He died on 17 March 1783, aged 73 (*Ann. Reg.* 1783, p. 200; *Gent. Mag.* liii. 273), and was buried at St. Martin's-in-the-Fields. His will, which is very curious, is printed in full in the 'Horological Journal,' November 1895.


Design'd by Cunningham
Engraved by Wm Humphrey
Mr. Christopher Pinchbeck
Publish'd May 1st 1783, by Willm Hebb Son in Law & Successor to the Late Mr Pinchbeck at his Shop in Cockspur Street

A portrait of Christopher Pinchbeck the younger by Cunningham
Engraved by W. Humphrey

References:

Authorities cited, and Wood's Curiosities of Clocks and Watches, p. 121; Britten's Former Clock and Watch Makers, p. 121; Noble's Memorials of Temple Bar; Notes and Queries, 6th ser. i. 241.

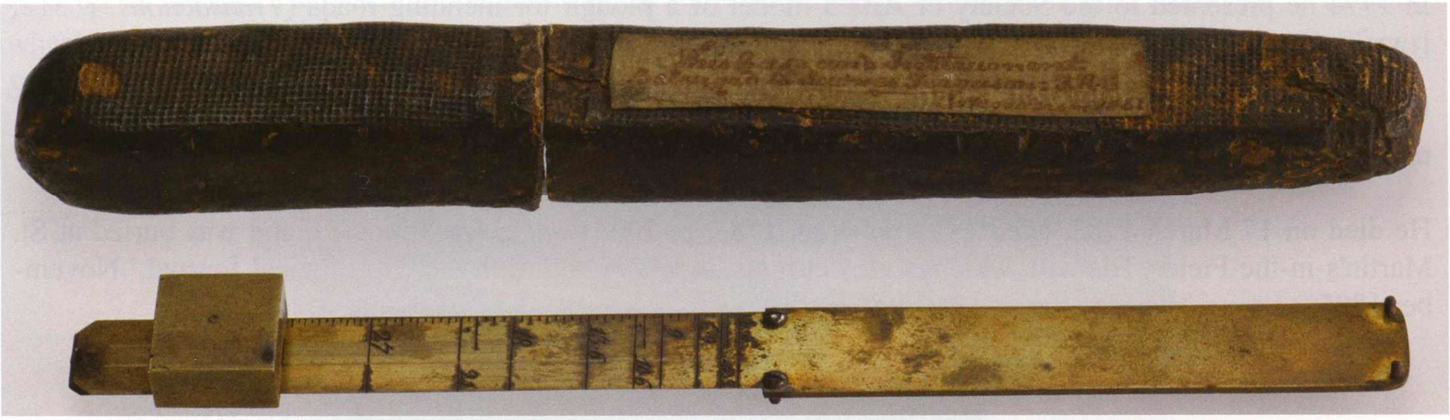
Acknowledgements:

The author wishes to thank Diana Crawforth-Hitchins and Stephen Barnett for providing information and photos for this article.

James Ferguson's Misidentified Coin Balance

BY TACYE PHILLIPSON

A small 18th century balance, formerly the property of James Ferguson, has been misidentified for most of its history. James Ferguson FRS (1710-1776) was a Scottish astronomer and inventor of clocks and orreries – moving models of the solar system. His formal education consisted merely of three months at grammar school, at the age of seven; his formal employment started when he was ten, tending sheep. He educated himself in mechanics and science, while making a living as a servant and later a painter of portrait miniatures before becoming a popular public lecturer and demonstrator on astronomical and other scientific subjects. He was particularly noted for his invention of astronomical models and mechanical apparatus.



The labelled case and long misidentified coin balance, Banff Museum, image National Museums Scotland.

In the 19th century, his biographer Ebenezer Henderson collected Ferguson relics and ensured the preservation of those he could secure in the Banff Museum, near Ferguson's birthplace. Among the items he catalogued in 1867[1] was *An Old Black Case and Brass Scale. – The case contains a thin brass scale graduated, and has a brass slider ; supposed to have been Ferguson's dialling scale.* A dialling scale is used in drawing out sundials, and will have either an hour scale or a latitude scale, or both. This artefact has a single scale, which is not either of these. It was additionally described in 1932 by John Calthorp,[2] looking at the material in the Banff Museum, as *A small black case, containing a small brass scale with unequal divisions, the purpose of which is difficult to imagine,* and *of sentimental rather than of scientific interest*. A paper label stuck to the case reads *This case and instrument Belonged to James Ferguson: F.R.S. E Henderson 1861* and a late 20th century note accompanying it reads 'pendulum?'

The item is in fact a coin balance with a sliding weight. It is 15 cm long and the scale is engraved 4.6, 5.3, 6.9, 10.6, 13.6, 18, 21, 27, 36 with 10.6, 21 and 36 each marked with an additional dot. On the reverse it is stamped with 'CP' and the serial number '1403', while the top appears to be stamped lightly with the initials RD (or BD) about 1 mm high. The whole is contained in a papier mâché case, with worn marbled paper on the join. A very similar balance with slightly different profile and no serial number is in the collections of the Museum of the History of Science in Oxford.[3] These balances were made and sold as the Tycho Brahe Coin Balance, advertised in 1773-4, and their maker has been identified by Michael Foster as Christopher Pinchbeck (1710–1783), a jeweller and clockmaker of London.[4] Their scales are graduated in shillings worth of gold, to cope with the extremely varied currency in circulation, especially Portuguese gold and lightweight coinage.

The distance between the pivot point and the centre of mass of a coin placed on the balance will depend on the diameter of the coin. This has been taken into account in the design of the balance in the spacing of the graduations; the markings for higher weights are closer to the pivot than would be the case for a simple proportional relationship (taking into account the size of the sliding weight). It does not have the intrinsic capacity to check the thickness of coins, which would be important in determining if they were indeed gold of the expected purity.

After a century and a half of misidentification this object is now described as a mid-18th century coin balance. It illustrates how a simple device can be repeatedly misidentified over a long period of time.

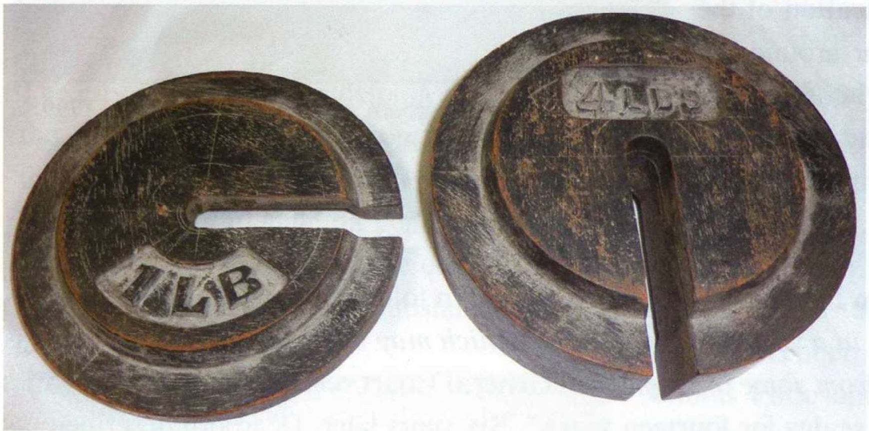
Acknowledgement:

I would like to thank Michael Foster for reviewing this note and identifying this coin balance as an example of the Tycho Brahe model and Dr Stephen Johnston for providing details of the Oxford example.

Notes and references:

1. Ebenezer Henderson, *Life of James Ferguson, F. R. S., in a brief autobiographical account, and further extended memoir*, Edinburgh, 1867
2. J.E. Calthrop, 'James Ferguson, the astronomer and the Ferguson relics', *Journal of Scientific Instruments*, Volume 9, Number 5, 1932
3. MHS inventory number 49217
4. Michael S. Foster, 'An Early Multi-Coin English Rocker Balance Maker – C. Pinchbeck', *Coin Scales - English Rockers and Their Markings*, ebook, 3rd edition, 2015, pp 385-90

Showcase



These two patterns for slotted platform scale weights still retain traces of the gray compound used to make them easier to release from the mold before the casting process begins. They are wooden, painted black and both measure $4^3/_8$" in diameter. The tops are labeled 1 Lb on right and 4 LB on left. The reverse are labeled W-51 and W-19 and both bear multiple small holes in the center backs from screws that were inserted into the wood to remove the patterns from the molds.

To learn more about casting iron and other metals see pages 4306-4312 in this issue of EQM.

Berning Collection.

Benjamin Dearborn: Vibrating Steelyards and Gold Standard Balances

BY DEBORAH WARNER

Whatever may be said of the utility of nine-tenths of the inventions of which the descriptions and models are deposited in the United States Patent Office, *no one who has ever seen that depository, or who has read a description of its contents, can doubt that they furnish the most incontestible (sic) evidence of extraordinary inventive genius.* So wrote John Canfield Spencer, the American editor of *Democracy in America*, in response to de Tocqueville's observation that *in America there are very good workmen but very few inventors.*[1] Spencer may never have met Benjamin Dearborn (1754-1838), but he surely would have applauded the achievements of this prolific American inventor who was also a printer, patriot, teacher, businessman, joiner of organizations, and promoter of the common good.[2]

Vibrating Steelyards

Having been raised in Portsmouth, New Hampshire, Dearborn must have gazed at ships carrying cargo to and from distant lands, appreciated the economic importance of trade and tariffs, and considered the several instruments used to weigh and measure barrels and bundles of goods. It is thus not surprising that his first important invention was a *new constructed balance or scales* which *for cheapness and convenience exceeds anything of the kind heretofore used.* This device, a modification of the simple steelyard that had long been familiar around the world, would eventually be used in custom houses, markets, and manufacturing establishments along the Atlantic seaboard, and become *productive of more emolument* than all of Dearborn's other inventions.[3]

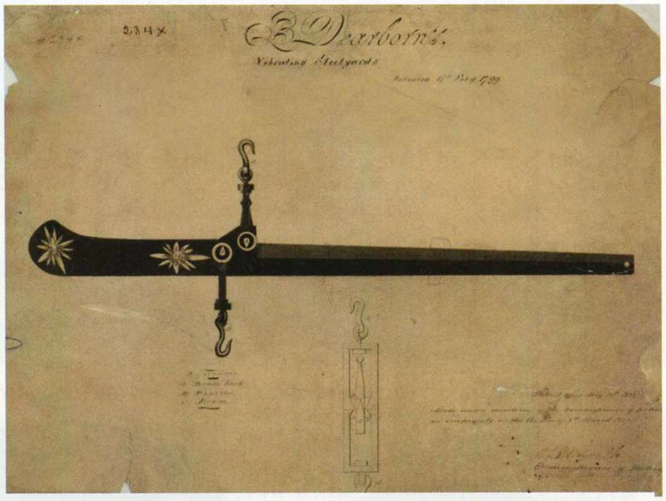


Figure 1. Dearborn's Vibrating Steelyards, 1799. Restored U.S. Patent #234x, National Archives, College Park, Maryland, RG 241.

The earliest evidence of new form dates from February 1786, when Dearborn told the New Hampshire legislature that he had *spent much time and money in a variety of inventions, which may be of public utility*, and was *desirous of enjoying some exclusive benefit from some of them.* The General Court responded by granting him *exclusive right of making and vending* these scales for fourteen years.[4] Six years later, Dearborn described his *New Invented Steelyard* to the American Academy of Arts and Sciences in Boston, explaining that it *was designed to correct the errors of fraud and accident, to which those of the common kind are liable.*[5] Dearborn received a patent for his *vibrating steelyard* on February 14, 1799. The original papers were lost in the Patent Office fire of 1836, but a restored copy of the drawing (# 234x) can be seen in the National Archives in College Park, Maryland. An early account explained that in this design, the center of motion, center of gravity, and points of suspension were so adjusted that the beam *vibrates like a scale-beam, when loaded with weights in equilibrium, and when unloaded.*[6]

In August 1799, now living in Taunton, Massachusetts, and boasting that he was *by birth and principle, a genuine American*, Dearborn announced that he had *established the manufacture of a Vibrating Steelyard; or Just Balance, for which he has a patent, under the seal of the United States.* This instrument, he went on to say, unites *the convenience of the Steelyard with the accuracy of the Scale Beam*.[7] (Scale beam being a common term for the equal arm balance.) Dearborn's broadside *Description of the Vibrating Steelyard, or Just Balance: Invented by the Subscriber, and Secured to Him by Patent*, dated September 1799, detailed the benefits of the device, noted that it came in several sizes, for weighing from 100 to 1,000 pounds, and mentioned that arrangements had been made with merchants from Boston to Philadelphia. In June 1800, the Massachusetts legislature authorized the use of Dearborn's vibrating steelyard for *all cases of weighing through this Commonwealth*, provided that each beam and all the weights *be sealed by some public sealer of weights and measures*.[8] Other states would soon do likewise.

Dearborn took to the road in 1802, showing his wares and buying newspaper advertisements in several cities. James Simons, the Collector of the Customs in Charleston, organized trials in which Dearborn's Patent Balance proved to be more accurate and easier to manipulate than the scales formerly in use.[9] George Lee, a Salem shipping master, would later find Dearborn's proportional balances with brass weights to be more accurate than those found in foreign ports, and to save him substantial amounts of money.[10] Speaking to the Massachusetts Charitable Mechanic Association in 1812, Dearborn's friend John Fairbanks noted that the improved steelyard *exhibits another proof of the great advantage derived from the union of theory and practice, of science and art*, going on to say that they *facilitate the labor of weighing and prevent deception. The business is reduced to a regular system and rendered intelligible to all.* And they *cost but about half the price of scales and weights*.[11]

I don't know if Dearborn met Thomas Jefferson in Washington in the summer of 1802, but I do know that Jefferson thanked Dearborn for lending a manuscript of some sort, and suggested that an open-work beam would be better than a solid one. Jefferson bought a small steelyard from Dearborn, for his personal use, a few months later.[12]

The city fathers of Philadelphia had considered Dearborn's steelyard in 1799, but not approved it for use in the city markets. Dearborn reiterated his request in 1803, this time providing a lengthy justification. For those who thought his invention was not new, and thus not worthy of a patent, he claimed he had shown an example to a Philadelphia gentleman some twenty years earlier. For those who worried that his steelyard shared some features with the common steelyard (as shown, for instance, in the *Encyclopaedia Britannica*), Dearborn pointed out the substantial differences, and suggested that *One principle makes not a system*. Samuel Webber, the Hollis Professor of Mathematics and Natural Philosophy at Harvard, had verified *the statistical correctness* of the principles of Dearborn's design and Webber's report had convinced the Legislature of Massachusetts to authorize its use in the markets of that state. Other states too, as well as Washington City, had recognized the *accuracy and convenience* of the new steelyard. Government officials authorized its use for weighing cannon in the armories, and goods coming into the country; and the president, secretary of the treasury, and secretary of war had examples *for use in their respective families*. Dearborn ended his petition with testimonials from two prominent Philadelphia intellectuals: the English-born architect Benjamin Latrobe, and the French-born linguist Peter Du Ponceau.[13]

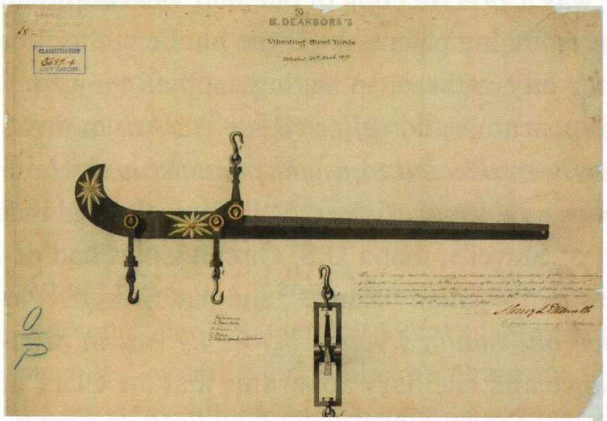


Figure 2. ▲▲ Dearborn's Vibrating Steelyard, 1819. Restored U.S. Patent #3089, National Archives, College Park, Maryland, RG 241.

Dearborn received a second patent (#3089) for the vibrating steelyard in March 1819. Here again, the text has been lost, but the restored images show how it might be mounted for use with heavy loads. In the *Report on Weights and Measures* that he delivered to Congress in 1821, John Quincy Adams noted that *the patent scales of Dearborn are used in most of the Custom-houses thro'-out the Union.* And although few of these scales were provided with the avoirdupois heavy weights, their *correctness and convenience are generally attested by the collectors who have them in use*, and they may be *relied upon with all the confidence of which any steelyard can be susceptible.*[14]

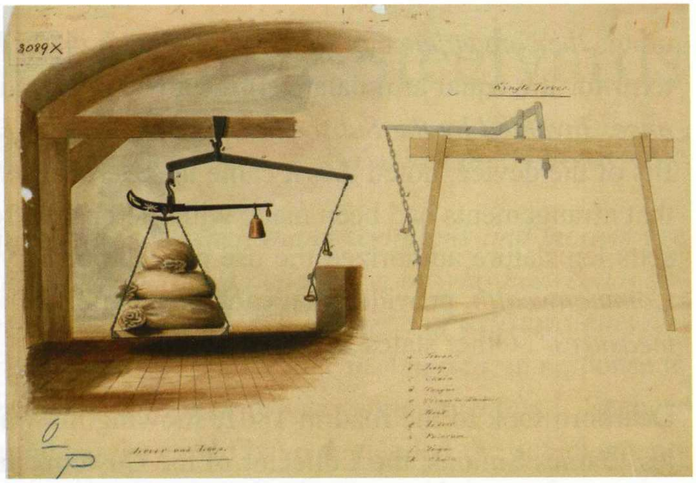


Figure 3. ▲▲ Dearborn's Vibrating Steelyard, hung from the rafter of a building, 1819. Restored U.S. Patent #3089, National Archives, College Park, Maryland, RG 241.

Platform Balances

In an advertisement from 1808, Dearborn mentioned platform balances for weighing loaded carriages and live cattle, proportional balances for weighing articles of merchandise, and crane balances for weighing materials *on their route from place to place, without unloading*—all of which incorporated the vibrating steelyard.[15] Three years later, Dearborn called attention to the platform balance *lately invented by him,* noting that it was *superior to every other instrument for weighing loaded carriages of all kinds or live animals* and was *equally applicable for loose hay or any other description of weight goods*. Acknowledging that his first two examples had been expensive, Dearborn noted that his new model would probably cut the cost in half. The Selectmen of Boston discussed Dearborn's platform balance soon thereafter, and considered whether it *could be adopted by the Town to advantage.*[16] By 1815, Dearborn was advertising platform balances *for weighing loaded carriages without hoisting the load, as the common hay-scales require*. The ad went on to say that the platform balance could be fixed in a Barn Floor, and *the most lively animals may be weighed thereon*, without perceiving any motion in the supporting mechanism. For a trial of working oxen, held at the Brighton Cattle Show in 1818, two wagons were loaded with stone, and weighed in *Mr. Dearborn's newly invented platform balance.*[17]

The subject came up again in the summer of 1824 when *A Friend to Mechanics* informed a Boston newspaper of the simplicity, durability, and accuracy of the platform balance that had recently been built by Amos Stevens, proprietor of a balance factory in Boston, and set up on Canal Street for the use of the City. *A Friend to Real Merit* responded by saying that Stevens' platform balance was a *precise copy* of one that Dearborn had invented *as much as twenty years since* and that had been covered by his patent(s). If the public authorities had asked the original inventor to erect a platform balance for the city, rather than having another *copy from his*, they would have had an accurate and substantial weighing apparatus, and *reflected some credit to themselves by patronizing one of their citizens, whose whole life has been devoted to useful pursuits, and whose first study is to benefit the public and assume the risk of deriving any remuneration.*[18] "J" then claimed that there was no resemblance between Dearborn's balance and that of Stevens, that a U.S. Circuit Court had decided that Dearborn was not the inventor of what he termed Dearborn's patent balances, and that Stevens was too modest *to claim the credit of an invention existing more than one hundred years 'before he was in existence'*. In his repost, *A Friend to Real Merit* stated that the balance and ancillary apparatus that the Clerk of the Boston Market had bought from Dearborn had worked well for some eight or ten years, and when they wore out, Stevens made a new one for the Market. He also noted that Dearborn had a parchment issued by the Patent Office, and signed by the President of the United States and the Attorney General—and even this was no security *against piracies of inventions.*[19]

Despite his several claims, Dearborn must have known that he had not invented the platform balance. James Renwick, a professor at Columbia College, told his students that platform balance had long been used in England for weighing loaded wagons and living cattle.[20] We now know that the English Turnpike Act of 1741 provided for the collection of tolls based on vehicle weight; and the first device that made this possible was the "weighbridge" designed by John Wyatt and built at Birmingham in the 1740s.[21]

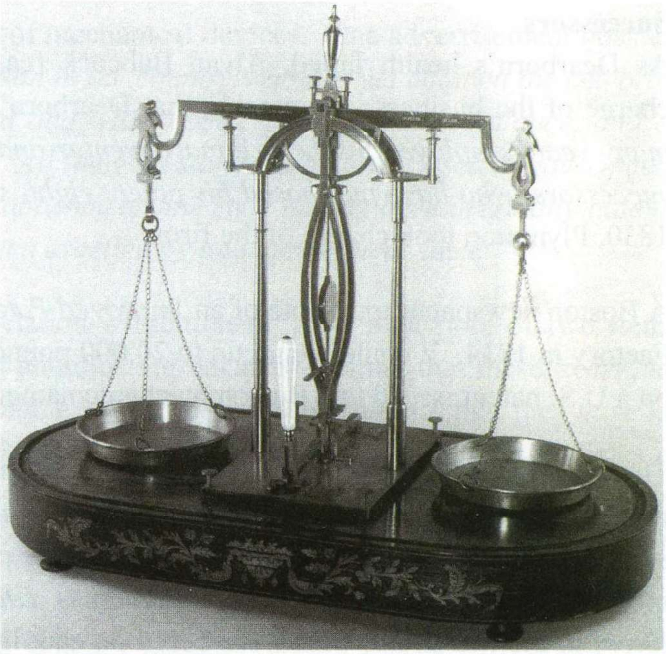


Figure 4. ⮝⮝ Dearborn's Gold Standard Balance, possibly made as early as 1801.

Courtesy Harvard University.

Precision Balances

Some Americans made equal-arm balances (small ones for coins or pharmaceuticals, and larger ones for agricultural or commercial purposes) in the colonial period, but Dearborn was the first American to tackle precision balances. He wrote a paper on the topic in 1801, and made some balances of this sort while in Taunton.[22] Returning to Boston in 1804, Dearborn established a Balance Factory near the western end of the Theatre. In a letter to James Madison, then serving as Secretary of State, Dearborn mentioned his ability and willingness to produce the standard weights called for in the Constitution, adding that his balances *are now preferred by our Banks, &c to any instrument heretofore known, for accurate weighing.*[23] He advertised *GOLD STANDARD BALANCES* for *Bankers, or Sealers of Weights* as well as hydrostatic balances *for detecting counterfeit coins, and for ascertaining the proportion of alloy in coins which are more or less valuable than the American standard.* A contemporary puff piece, perhaps self-authored, called attention to the elegance and accuracy of Dearborn's balances seen in banks.[24] In his single-sheet *Directions for Using the Gold Standard Balance* (1817), Dearborn boasted that this balance *has now survived the scrutiny of fifteen years, in which time it has been adopted by all the Banks in Boston, and many others in the United States*, and so he feels justified *in recommending it to all Banking Institutions wherein superior accuracy is an object of ambition.*

Competitors

John Edwards (d. 1833) was an immigrant from Liverpool who settled in New York City and began advertising his *warranted scale beam manufactory* in 1801. He obtained two U.S. patents on May 19, 1806, one for steelyards (#688X) and another for scale beams and balances (#689X). I have found no descriptions of these devices and, since Edwards died before the Patent Office fire of 1836, and apparently had no heirs to see to his legacy, his patent drawings were never restored.

Samuel Hills, of Lincoln, Massachusetts, obtained a U.S. patent for a steelyard on December 27, 1815. The following year, the General Court of Massachusetts approved the use of the vibrating steelyard *invented or improved* by Hills for public weighing throughout the commonwealth.[25] Maine followed soon thereafter. We know from their early patent papers that Erastus and Thaddeus Fairbanks were familiar with Dearborn's designs and for many years the Fairbanks firm produced steelyards with Dearborn's distinctive curved shorter arm design. Sears, Roebuck & Co. was still selling steelyards (which they called scale beams) of this sort at the end of the century .[26]

Successors

As Dearborn's health failed, Alvan Babcock (ca. 1785-1830) and Henry Plympton (ca. 1796-1862) took charge of the business, announcing that Dearborn's Patent Balances are now *manufactured by workmen for many years employed by the original inventor and patentee, and now under the immediate inspection of his successors, who have purchased his patent right, stock, tools, &c.*[27] Following Babock's death in December 1830, Plympton took charge of the firm.

A Boston newspaper took note of an *Improved Patent Platform Balance* recently made by Plympton's Balance Factory in 1834. It could weigh up to 20,000 pounds, was intended for the Worcester Railroad, and was based on a U.S. patent issued to a Boston mechanic named Samuel L. Hay.[28]

The Massachusetts Charitable Mechanics Association awarded Plympton a gold medal in 1837, the exhibition judges finding that his platform balance *appears to be constructed on correct philosophical and mechanical principles.* Then, after inspecting and testing the platform balance displayed by E. and T. Fairbanks, of Vermont, the judges decided that, *although there is a difference in the construction and the manner of applying the levers* in the two forms, both were based on equally correct principles and, workmanship being equal, the results must be equally certain. The judges concluded by saying that the public is under *great obligations to both these gentlemen, for their skill and perseverance in bringing so near perfection a machine of so much importance as the platform balance.*[29] Before making their decision, the M.C.M.A. judges went to Plympton's factory, examined the standard balance being built for the town of New Bedford, and concluded that Plympton *fully sustains the character which was so honestly earned by his predecessor, Mr. Benjamin Dearborn, one of the oldest and best mechanics of our city.*

In 1837, when calling attention to a *new Platform Balance* recently erected in the southern end of Boston, the City Weigher noted that it had been *furnished from the manufactory of Mr. Henry Plympton, successor to the original inventor, Benj. Dearborn, Esq.*[30] In 1838, Massachusetts paid Plympton $1,280, *in full compensation for weights and balances furnished by him for the Treasury of the Commonwealth.*[31] That same year, Plympton served as executor of Dearborn's fairly large estate.[32]

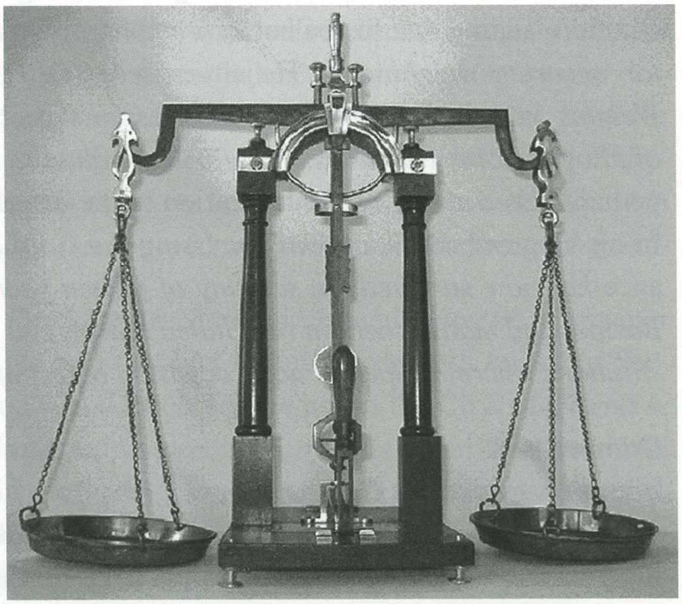


Figure 5. ∧∧ Marked on the beam is B. Dearborn's Gold Standard Balance, Boston Mass. From the manufactory of Henry Plympton, Boston, 1837. Pugsley Collection.

By 1844, the balance factory in Theatre Alley was styled Stephenson, Howard and Davis. Luther Stephenson was a businessman whose sister Olive would marry the widowed Henry Plympton; Edward Howard and David Potter Davis were machinists who had apprenticed with the clockmaker, Aaron Willard, Jr.[33] After this partnership disbanded a few years later, Stephenson opened a balance factory in his home town of Hingham, Massachusetts. L. Stephenson & Co. was still going strong in the 1880s, and still identifying as "Successors to Dearborn."[34]

Howard & Davis remained in Boston, and offered a range of mechanical devices. One advertisement boasted that *As a Balance and Scales manufacturer, there is no person in the country who has yet attained the celebrity of Mr. Benjamin Dearborn, the inventor of the far famed and widely used Gold Standard Balance, and of whom Howard & Davis are the acknowledged successors. All the gold standard balances used in government offices and banks, throughout the Union, are from this establishment; the style having been originally patented by Mr. Dearborn, half a century ago, and not having been excelled by an improvement since.*[35]

Judges at the Massachusetts Charitable Mechanics Association exhibition of 1850 took note of two items shown by Howard & Davis—a gold standard balance and an adjusting balance—stating that these *exact and excellent instruments are so thoroughly and so delicately made, and so beautifully finished*, that they *have no hesitation in recommending that a Silver Medal be awarded to the maker.* The Judges added that articles *of far less merit have received a still higher reward*, and if the rules had not stated *that the highest honor is to be reserved for inventions or very valuable improvements,* Howard & Davis *would have been awarded the highest honor ever given by the Association.*[36]

Some years later, local businessmen organized the Boston Watch Company, built a factory at Roxbury, and hired Howard and Davis, *whose astronomical and office clocks and gold standard balances have a reputation unsurpassed throughout this continent*, to look after the mechanical department.[37] By 1860, having become E. Howard & Co., this firm announced that: *In the manufacture of Gold Standard Balances, we continue as successors to the well-known and highly esteemed makers, BENJAMIN DEARBORN and HENRY PLYMPTON, ESQS. We keep on hand three sizes, but manufacture to order any capacity desired. All the Boston Banks have our Balances in daily use, and they are acknowledged as the standards throughout California. The regular sizes are of the respective capacities of 1,500, 3,000 and 5,000 penny-weights. They are made of the very best materials and the highest grade of workmanship; all the bearings jeweled, and nothing omitted to secure perfect accuracy in weighing, with beauty of finish; each is mounted on a marble slab, and enclosed in a glass case, with balanced slide front.*[38]

Several gold standard balances can still be found. The Museum of Fine Arts, in Boston, has one that may have been used in the Boston Customs House; the beam is inscribed *B. DEARBORN GOLD STANDARD BALANCE BOSTON MASSACHUSETTS 1834*. Another example, thought to have been used by the Bank of American Loan & Trust Co. in Providence, Rhode Island, was sold at a Skinner auction in 2009. Another example, smaller and more delicate, and provided with weights and instructions, belonged to Samuel Eliot (1739 -1820), a banker in Boston; it is now in the Collection of Historical Scientific Instruments at Harvard University.[39] The Boston Department of Weights and Measures has an example made by Plympton. The Wells Fargo Museum in San Francisco has one by Howard & Davis that could allegedly "*weigh every grain a miner brought forth.*[40] The Juneau Museum has one marked *Gold Standard Balance. Howard & Davis Manufacturers. Boston, Mass. Full Jewelled.* The Bostonian Society has bits and pieces of one; the bottom of one pan is marked: *HOWARD & / DAVIS / BOSTON*.

Notes & References:

1. John C. Spencer note in Alexis de Tocqueville, *Democracy in America* (New York, 1838), vol. 1, p. 314.
2. Emma Forbes Waite, "Benjamin Dearborn: Teacher, Inventor, Philanthropist," *Old Time New England* 42 (Oct.-Dec. 1941): 134-142.
3. Notice of Dearborn's death in *Daily National Intelligencer* (March 3, 1838).
4. "New Hampshire," [Boston], *The Massachusetts Gazette* (Jan. 26, 1787), p. 2. "An Act Pass'd January 12th 1787," in [Portsmouth] *The New Hampshire Gazette and General Advertiser* (April 23, 1788), p. 1.
5. Benjamin Dearborn, "Description of a New Invented Steelyard," *Memoirs of the American Academy of Arts and Sciences* 2 (1804): 23-24.

6. “Newly Invented Vibrating Steelyard” in Samuel Latham Mitchell, *The Medical Repository* 3 (1800): 300-301.
7. “To the American Public,” [New Bedford] *Columbian Courier* (Sept. 11, 1799), p. 1.
8. “An Act to authorize the Use of the Vibrating Steelyard,” in *The General Laws of Massachusetts* (Boston, 1823), vol. 2, p. 38.
9. “Patent Balance” in [Charleston] *South Carolina State Gazette* (Aug. 17, 1802), p. 4; and [Washington] *National Intelligencer* (Sept. 15, 1802), p. 1.
10. Geo. G. Lee testimonial in [New York] *Daily Advertiser* (Nov. 8, 1804), p. 3.
11. John Fairbanks, *An Address Delivered Before the Massachusetts Charitable Mechanic Association* (Boston, 1812), p. 29.
12. Thomas Jefferson to Benjamin Dearborn, June 5, 1802. For this and much other correspondence with the founding fathers, see http://founders.archives.gov/
13. [Benjamin Dearborn], *The Patent Balance Compared with Other Instruments for Weighing* (Philadelphia, 1803).
14. John Quincy Adams, *Report Upon the Weights and Measures* (Washington, 1821), p. 139.
15. “Specifications of sundry Articles, invented by Benjamin Dearborn, and sold at his Balance-Factory, near the western end of the Theatre, in Boston, Massachusetts,” in *New-York Herald* (Aug. 17, 1808), p. 1.
16. Dearborn letter in [Philadelphia] *Poulson’s American Daily Advertiser* (March 27, 1811), p. 2. City Document 84, in *Records Relating to the Early History of Boston* 38 (Boston, 1908), p. 34.
17. “Proportional Balances,” ad in [Boston] *Independent Chronicle* (May 11, 1815), p. 4. “Brighton Cattle Show,” [Washington, D.C.] *Daily National Intelligencer* (Oct. 24, 1818).
18. “A New Invention for Weighing,” [Boston] *Columbian Centinel* (July 17, 1824), p. 2. “Honor to whom honor is due.” [Boston] *Columbian Centinel* (July 21, 1824), p. 2.
19. “Communication,” *Columbian Centinel* (July 24, 1824), p. 2. “For the Centinel,” *Columbian Centinel* (July 31, 1824), p. 2.
20. James Renwick, *Outlines of Natural Philosophy* (New York, 1826), vol. 1, pp. 24-25.
21. W. A. Scheurer, “The Science of Weighing—Yesterday,” in L. J. Chisolm, ed., *Report on the 50th National Conference of Weights and Measures* (Washington, D.C., 1966), p. 93.
22. “Remarks on the Construction of the Common Scale-Beam, with a Description of the New Gold Standard Beam, Invented by the Author, Mr. Benjamin Dearborn,” *Memoirs of the American Academy of Arts and Sciences* (Jan. 1809): 40-50. This is a revised version of a paper dated 1801.

23 Dearborn to James Madison, March 6, 1804. Dearborn to Jefferson, Nov. 3, 1808.

24. *Dearborn’s System for Weighing with Ease, Dispatch, and Precision purchased for half the cost, and used with half the labor, of scales and weights* (Boston, 1804). “Improvement in Useful Arts,” *The Boston Weekly Magazine* (July 7, 1804): 146. Dearborn advertisements in [Boston] *New England Palladium* (Feb. 19, 1805), p. 4, and in *Boston Commercial Gazette* (Nov. 1805), p. 4.
25. *Laws of the Commonwealth of Massachusetts* (Boston, 1816), p. 291. He was of Lincoln, Mass.; patent in 1815.
26. Sears, Roebuck & Co., *Catalogue* (1897), p. 62.
27. Ad in *Bangor Register* (Jan. 6, 1829).
28. “Mr. Editor,” in *Boston Traveller* (Aug. 5, 1834), p. 3.
29. Massachusetts Charitable Mechanics’ Association, *First Exhibition and Fair* 1 (1837): 92-93.
30. “Public Notice,” in [Boston] *the Atlas* (Sept. 15, 1837).
31. Massachusetts Charitable Mechanics’ Association, *First Exhibition and* Fair (1837): 52-53, and 94. *An Account of the Treasure of the Commonwealth of Massachusetts* (Boston, 1838), p. 33.
32. *The Will of Benjamin Dearborn, Esq.* (Boston, 1838).
33. “Letter Balance,” *The Boston Daily Atlas* (Sept. 19, 1845).
34. Ad in *the Massachusetts Register for the Year 1855*. “Balance and Scale Manufactory” in David Bigelow, *History of Prominent Mercantile and Manufacturing Firms in the United States* (Boston, 1857), vol. 6, pp. 190-191. “L. Stephenson & Co.” in *Leading Manufacturers and Merchants of the City of Boston* (Boston, 1885), p. 103.
35. Howard & Davis ad in *The Stranger’s Guide in the City of Boston* (Boston, 1848), p. 31.
36. *The Sixth Exhibition of the Massachusetts Charitable Mechanics Association* (Boston, 1850), p. 102.
37. Edwin T. Freedley, ed., *Leading Pursuits and Leading Men: A Treatise on the Principal Trades and Manufactures of the United States* (Philadelphia, 1860), pp. 387-388.
38. E. Howard & Co., *Clocks and Fine Watches* (New York, 1860), p. 28.
39. Diana Crawforth, “Dearborn’s Gold Standard Balance,” *Equilibrium*, pp. 1211-1216.
40. Robert Joseph Chandler, *Wells Fargo* (Charleston, S.C., 2006), p. 28.

Editor’s Notes:

The editor regrets that she was not provided illustrations. Dearborn Balances can be seen at the following websites:
http://www.mfa.org/collections/object/gold-standard-balance-46111
http://www.skinnerinc.com/auctions/2447/lots/116
http://waywiser.rc.fas.harvard.edu/view/objects/asitem/Objects@11779/1?t:state:flow=0af56dbe-53db-4ce7-a22b-cbd11738d576
More info on Dearborn scales can be found in EQM pp. 1211-1216, 2367-2376, 2639-2643 and 3037-3039.